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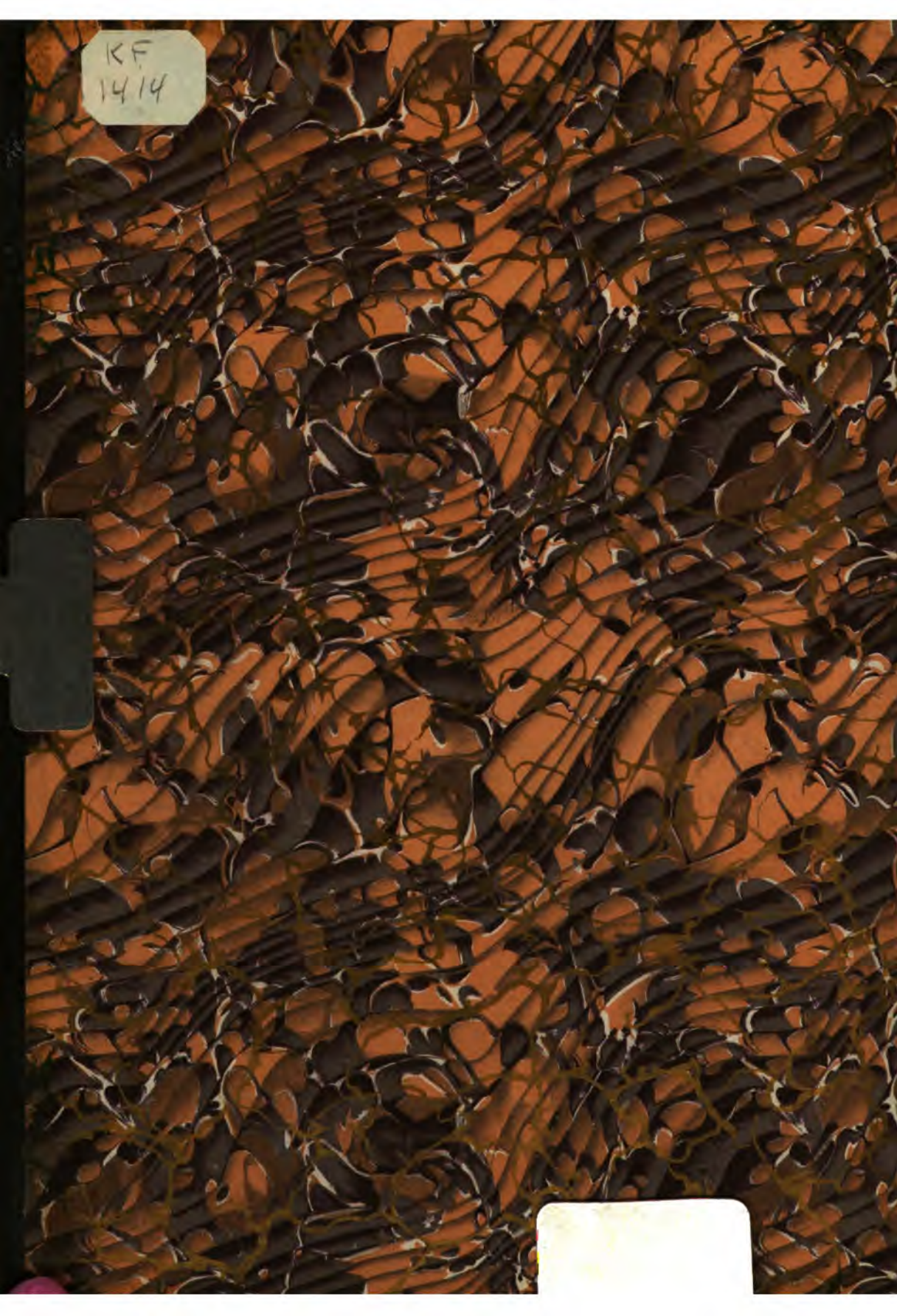

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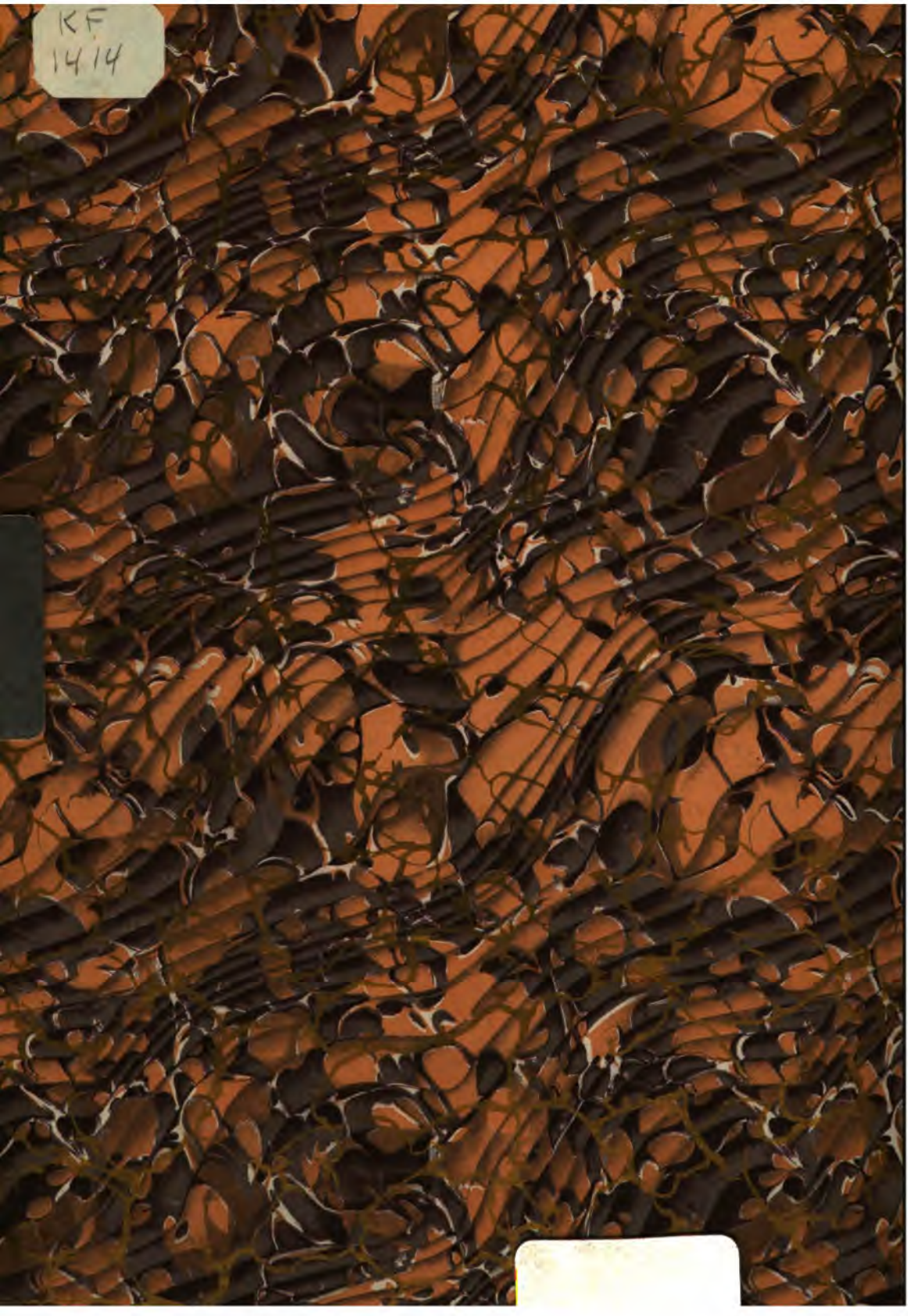

THE

STUDENT'S REFERENCE WORK

A CYCLOPÆDIA

FOR

TEACHERS, STUDENTS, AND FAMILIES

EDITED BY

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Mab, a fairy celebrated by Shakespeare, Ben Jonson, and other poets. She is usually called Queen Mab, but this does not mean that she is queen of the fairies. That place belongs to Titania, the wife of Oberon. For a description of Queen Mab's mischievous ways, telling how she comes "athwart men's noses as they lie asleep," etc., see Shakespeare's *Romeo and Juliet.* In Shelley's *Queen Mab,* she is made queen of the fairies and given a much wider realm to reign over, —the deeds and thoughts of men.

Macad'am, John Loudon, inventor of the system of roadmaking known as "macadamizing," was born at Ayr, Scotland, Sept. 21, 1756. In 1801, he began to make experiments in road-building, a work to which his future life was devoted. His system was adopted on nearly all the public roads of England, and was introduced into France and other countries. The principles of his system may be briefly stated: In constructing a road it is not necessary to lay a foundation of large stones, as it is a matter of indifference whether the foundation be hard or soft. The material for the road must consist of broken stones, one or two ounces in weight, scattered to a depth of from six to ten inches, and pressed together as closely as possible. The road is to have a slight fall from the middle to the sides, and ditches are to be dug on each side of the road of sufficient depth to drain it. Macadam was offered the honor of knighthood some time before his death, but declined it. He died at Moffat, Dumfriesshire, Nov. 26, 1836.

McAll' Mission, the largest Protestant mission in France, was founded in 1871 by Rev. R. W. McAll and his wife. It embraces more than one hundred stations, nearly all of which are in the city of Paris, and is supported by Protestants of all denominations in both England and America. Such has been the progress of this mission that in the 12th year after its foundation it held 15,000 meetings, attended by nearly 1,000,000 persons, and distributed more than 500,000 Bibles and tracts.

Macaroni (*mǎk-a-rō'nĭ*), a peculiar paste or dough manufactured from wheat flour into tubes, ribbons, or threads. It is an Italian invention, and although the process is very simple, the manufacture of macaroni is almost wholly limited to Italy and France, probably because the wheat raised in those countries contains so large a proportion of gluten. Macaroni is used for soups, and is exported to all parts of the world.

MacAr'thur, Arthur, American soldier, major-general in the regular army, was born in Massachusetts, but served during the Civil war in the western army; entering the service as a lieutenant in the 24th Wisconsin Infantry, Aug. 4, 1862, and rising to a brevet colonelcy, given for conspicuous bravery at the successive engagements of Perryville, Stone River, and Missionary Ridge. For his gallantry in the latter engagement he was voted a medal by congress. He served throughout the Atlanta campaign and was mustered out only after the final review of the volunteer forces, June 10, 1865. The next year, Feb. 23, 1866, he was commissioned as first lieutenant in the regular army and assigned to the 17th Infantry; but a few months later he was promoted to a captaincy and transferred to the 36th Infantry. At the outbreak of the war with Spain, he was serving in the office of the adjutant-general with rank of lieutenant-colonel. On May 27, 1898, he was appointed brigadier-general of United States Volunteers, and promoted to major-general commanding 2d division, 8th army corps soon after, and assigned to duty in Havana. In 1899, he was sent to the Philippines where he rendered conspicuous service, was made brigadier-general in the regular army, and, on the retirement of General Otis, was placed in command of the army in the Philippines and also made military governor of the islands. In February, 1901, he was promoted to major-general in the regular army.

McAr'thur, Duncan, an American pioneer, was born in Dutchess county, N. Y., June 14, 1772. He was with General Wayne in his campaign against the Indians in 1797, and soon after that settled in Ross county, O., where he acquired a large landed estate. In the War of 1812, he was commissioned brigadier-general in the army, and in 1814 succeeded General Harrison in command of the army of the west. As such he partly executed a bold plan for conquering upper Canada, which he was obliged to relinquish on account of the failure of other forces to cooperate with him. He served a term in congress, 1823–25, and was governor of the state from 1830 to 1833. He died in Ohio, April 28, 1839.

Macassar (*ma-kăs' sar*), a strait about 400 miles long and from 100 to 200 miles wide, connecting the Java and Celebes seas, and separating the island of Celebes from that of Java.

Macaulay (*ma-kaw'lī*), **Thomas Babington,** Lord, a great English historian and essayist and the most pictorial prose-writer in English literature, was born in the village of Rothley, Leicestershire, Oct. 25, 1800. From his earliest infancy he showed an eager desire for knowledge and remarkable capacity for composition, both in prose and poetry. As a boy he attended a private school kept by Mr. Preston, a low-church clergyman, and at the age of eighteen entered Trinity college, Cambridge. His university career was very brilliant, in spite of his dislike to mathematics. Macaulay was admitted to the bar soon after his graduation; but his love of literature was so great that he made no effort to secure a legal practice. At the age of twenty-five, he published an essay on Milton, in the *Edinburgh Review*, which at once placed him in the highest rank of literature, and for nearly twenty years afterward he continued one of the principal writers for that magazine. In 1830, Macaulay entered parliament, where his powers as a debater and orator proved fully equal to his talent as a writer. In 1834, he accepted the position of legal adviser to the supreme council of India, at a salary of £10,000 ($50,000) a year. He remained in India four years, during which, in addition to the duties of his office, he gave considerable time and attention to the preparation of a new India penal code, and also wrote his essays on Bacon and Sir James Mackintosh. Macaulay was elected to parliament from Edinburgh the year after his return from India, and during the few years he continued in public life greatly increased the fame he had previously won. In 1848, appeared the first two volumes of his great work—*History of England from the Accession of James II.* The popularity of this book was, perhaps, greater than was ever secured by any history, and the interest and delight with which it was read were almost beyond description. The third and fourth volumes appeared in 1855, and were received with the greatest favor and enthusiasm, both in England and America. In 1857, Macaulay was made a peer of the realm under the title of Baron Macaulay of Rothley. In the same year he was elected a foreign associate of the French Academy of Moral and Political Sciences. He died Dec. 28, 1859, and was buried in Westminster Abbey, Jan. 9, 1860. See *Life and Letters*, by Trevelyan.

LORD MACAULAY.

Mac'beth', a Scottish king, whose name has been immortalized by Shakespeare in his matchless play, *Macbeth*. In 1040, he slew Duncan, king of Scotia, and succeeded him on the throne. His seventeen years' reign is described in the chronicles as a time of plenty. Alone of Scottish kings he made a pilgrimage to Rome (1050), where he gave very large alms to the poor. In the year 1057, Malcolm Duncan, who had fled to England after the murder of his father, returned to Scotland, and, marching a hostile force against Macbeth, defeated and killed him at the battle of Lumphanan, after which Malcolm was proclaimed king.

Maccabees (*măk'ka-bēz*), the name assumed by the patriotic Hebrew Mattathias (and his descendants), who first resisted the persecutions inflicted upon the Jewish people by the Syrian king, Antiochus Epiphanes (175–164 B. C.). Mattathias had retired with his five sons, at the beginning of these troubles, to a small place called Modiin, between Jerusalem and Joppa, to mourn over the desolation of the city and the desecration of the temple. He was pursued to this point by the Syrians, and when one of their captains tried to bribe him to abandon the Jewish faith, he answered by slaying with his own hand the first Jewish renegade who approached the altar of idolatry. This bold act was the signal for a general outbreak. The five sons of Mattathias, with a few faithful followers, rose against the national foe, destroyed all traces of heathen worship, and then fled into the wilderness of Judæa. Not long after, they entered the adjacent cities and villages, circumcising the children, and restoring the ancient religion of Jehovah. At the death of Mattathias, 166 B. C., his son Judas took command of the patriots, repulsed the enemy at Mizpah and other places, reconquered Jerusalem, purified the temple, and restored the worship of Jehovah. Having further concluded an alliance with the Romans, he fell in battle with Bacchides. Judas was succeeded by his brother Jonathan, who also acquired the dignity of high priest. Jonathan was treacherously murdered at Ptolemais, 141 B. C., and was succeeded by his brother Simon, the second of the five sons of Mattathias. The reign of Simon marked a new era in Jewish history. His power was almost absolute, but it was exercised with great moderation and "Judah prospered as of old." The reign of the Maccabean family continued until the time of Herod the Great. See *History of Israel*, by Ewald; *History of the Jews*, by Milman.

McCarthy (*mă-kär'thī*), **Justin,** Irish historian and novelist, was born at Cork, Nov. 22, 1830. He joined the staff of the *Northern Times*, Liverpool, in 1853, and in 1864 became chief editor of the London *Morning Star*. He resigned this position in 1864, and devoted the next three years to a tour

through the United States. He entered the house of commons in 1879, as member of Longford, a liberal, but his literary works have extended his name much further than his political triumphs. Among his best-known novels are, *Paul Massie* (1866), *The Waterdale Neighbors* (1867), *My Enemy's Daughter* (1869), *Miss Misanthrope*, *Dear Lady Disdain*, *Donna Quixote*, *Maid of Athens*, *Red Diamonds*, *A Fair Saxon*, etc. His historical writings, on which his fame mostly depends, are *History of Our Own Times*, *History of the Four Georges*, *Epoch of Reform*, *Life of Sir Robert Peel*, *Life of Pope Leo XIII.*, *Modern England*, *Reminiscences*, *The Story of Mr. Gladstone's Life*.

JUSTIN M'CARTHY.

McClel'lan, George Brinton, an American general, was born at Philadelphia, Dec. 3, 1826. He graduated at the West Point Military academy in 1846, one of his classmates being the renowned "Stonewall" Jackson. He served as an engineer during the Mexican war, winning a brevet-captaincy by his skill and bravery. He continued to serve as an officer in the regular army until 1857, when he resigned his commission to engage in railroad business. When the Civil war broke out, in April, 1861, Governor Dennison of Ohio appointed him major-general of Ohio volunteers, and in May he was appointed major-general of United States troops by President Lincoln. He was immediately sent into West Virginia, and during the month of July conducted a short and very successful campaign against the Confederates in that state. On account of this signal success of McClellan, he was soon after called to Washington to reorganize the army of the Potomac and prepare it for another advance upon the enemy. On the retirement of General Winfield Scott, in November following, McClellan was made commander-in-chief of the army. As an organizer, he showed marked ability and efficiency; but he sorely tried the patience of both the administration and the people by the slowness of his movements—rather than by his failure to move at all. At length, in April, 1862, under the positive orders of the President, he entered on his disastrous Peninsular campaign. He advanced within a few miles of Richmond, but after fighting what is known as the "Seven Days' battles" (June 25 to July 1), he was driven back and was directed to abandon the peninsula. A large part of his army was now ordered to re-enforce General Pope's troops; but soon after the second battle of Bull Run, McClellan, in command of his army of the Potomac, marching northward, met the forces of General Lee at Antietam, Maryland, where there occurred one of the bloodiest battles of the war; but whatever advantage McClellan gained by this fight he failed to follow up, and General Lee was allowed to recross the Potomac without being molested. McClellan followed him into Virginia; but all his subsequent movements were so unsatisfactory to the President and cabinet, that in November he was relieved of his command and General A. E. Burnside appointed in his place. In 1864, he was the Democratic candidate against Lincoln for the presidency, but received the electoral vote of only three states—New Jersey, Kentucky, and Delaware. In 1877, he was elected governor of New Jersey, and filled that office for a term of years. He died at Orange, N. J., Oct. 29, 1885.

GENERAL GEO. B. M'CLELLAN.

McClin'tock, Sir Francis Leopold, was born at Dundalk, Ireland, in the year 1819, and entered the navy when only twelve years old. He served in Austin's expedition in search of Sir John Franklin in 1850, and made a sledge journey of several hundred miles along the northern shore of Parry sound. In 1857, he took command of the expedition fitted out by Lady Franklin to search for her husband. For his success in ascertaining the fate of Franklin, in addition to many other honors, he was knighted in 1860. During the same year he published a book containing a full account of his voyage in the Arctic seas in search of Franklin and his companions, entitled *The Fate of Sir John Franklin;* he has also published, *The Voyage of the Fox*. During the years 1879–82 he was commander-in-chief of an English squadron on the North American and West India station.

CARDINAL M'CLOSKEY.

McCloskey (*ma-klŏs'kĭ*), **John,** a cardinal of the church of Rome in America, was born at Brooklyn, N. Y., March 20, 1810. After pursuing a collegiate and theological course at St. Mary's college, Emmitsburg, Maryland, he was ordained a priest at St. Patrick's cathedral,

New York, Jan. 9, 1834. He was consecrated bishop March 10, 1844; archbishop May 6, 1864, and in 1875 was created cardinal, being the first American raised to that princely dignity. He died at New York, Oct. 10, 1885.

McCook', Gen. Alexander McDowell, was born in Columbiana county, O., April 22, 1831. He graduated at West Point in 1852, and after several years' service in the army was appointed instructor of infantry tactics in that institution. He was appointed colonel of the first Ohio regiment organized for service in 1861, which he commanded at the battle of Bull Run, July 21, 1861. He was afterward promoted to the rank of major-general, and as such commanded a division at the battles of Shiloh and Perryville. When General Rosecrans was placed in command of the army of the Cumberland, McCook was assigned to the command of the 20th army corps, with which he took part in the battles of Stone River and Chickamauga. Since the war he became colonel of the 6th Infantry, and was for a time in charge of the Military school at Fort Leavenworth. In 1895, he retired with the rank of major-general.

GEN. ALEX. M. M'COOK.

McCook', Gen. Daniel, was born at Carrollton, O., July 22, 1834, and graduated at Florence college, Alabama, 1857. He entered the Union army as colonel of the 51st Ohio volunteers in 1861, being afterward promoted to the rank of brigadier-general. In addition to a number of minor engagements, he participated in the battles of Perryville, Chickamauga, Missionary Ridge, and Kenesaw Mountain, Ga., in the latter of which he was killed, July 21, 1864.

McCook', Gen. Robert Latimer, was born in Columbiana county, O., Dec. 28, 1827. He was commissioned colonel of the 9th Ohio volunteers on the outbreak of the Civil war, and commanded a brigade in West Virginia under General Rosecrans, in the summer of 1861, highly distinguishing himself in a number of engagements. He was in command of a brigade in General Buell's army in August, 1862, when he was shot by guerillas while sick and traveling in an ambulance near Salem, Ala.

McCor'mick, Cyrus H., inventor of the McCormick reaping machine, was born at Walnut Grove, W. Va., Feb. 15, 1809. In the year 1847, he moved to Chicago, where he engaged in the manufacture of his machine, which soon came into extensive use, both in the United States and other countries. He amassed a large fortune and became noted for his great liberality. In 1859, he endowed the Presbyterian Theological seminary, at Chicago, which bears his name, and which is one of the best equipped and most prosperous educational institutions of the country. The total amount contributed by Mr. McCormick and his heirs to this and other institutions is over $1,000,000. Mr. McCormick died at Chicago, May 13, 1884. At the head of the great industry connected with his name, the McCormick Harvesting Machine company, is now Cyrus Hall McCormick, born in 1859 and graduated from Princeton in 1879. His uncle, Leander J. McCormick (born 1819), is known to the world of commerce to-day as the inventor-capitalist.

McCosh', James, a Scottish-American educator and philosopher, was born in 1811, in Ayrshire, Scotland. He was educated at the universities of Glasgow and Edinburgh, and while there earned the honorary degree of M. A. by his paper on the *Philosophy of the Stoics*, through the influence of Sir William Hamilton. He was ordained at Brechin a minister of the Church of Scotland in 1835, but joined in the Free-church movement in 1843. He was called to the chair of logic and metaphysics in Queen's college, Belfast, in 1851, and remained there until 1868, when the College of New Jersey, at Princeton, elected him as its president. By this step the college gained great benefit, for he imparted to it new life, and secured for it large donations by his personal influence. The writings of Dr. McCosh are marked by keen insight as well as clearness of statement; he belongs to the Scottish or "common sense" school of philosophy. The most important of his works are: *The Methods of Divine Government, Physical and Moral; Typical Forms and Special Ends in Creation; Intuitions of the Mind Inductively Investigated; An Examination of Mill's Philosophy; Laws of Discursive Thought; Logic; Christianity and Positivism; A Work on Scottish Philosophy*, besides papers on education and the relation of science to religion. In 1888, he resigned his office as president, to give his attention more closely to philosophical writing, and published *First and Fundamental Truths*, and *Religious Aspects of Evolution*. He died at Princeton, N. J., Nov. 16, 1894.

JAMES M'COSH.

McDon'ald, Sir J. Alexander, D. C. L., a Canadian statesman, was born in Scotland in

1815, but removed to Canada when a child. He was admitted to the bar in 1836, when barely twenty-one, and was elected to the Canadian parliament as a Conservative, in 1844, from Kingston, Ontario. Three years later, he became a member of the executive council, then receiver-general, and, not long after, commissioner in charge of the public lands of the colony. The Liberal party was in power from 1850 to 1854, but in the latter year a coalition cabinet was formed in which he became attorney-general, retaining office till 1862, when, upon the defeat of an important bill, the whole cabinet resigned. He returned to the new cabinet formed by Sir E. P. Taché in 1864, holding the same office as in the previous ministry. In 1865, Sir John became minister of militia; in 1868, minister of justice, and in 1869, premier of the Dominion cabinet, retaining office until 1873. It devolved upon him to form a new cabinet in 1878, in which he reserved for himself the ministry of the interior. He continued in office until 1891, the year of his death, having been violently opposed to the policy of reciprocity which existed by treaty between the United States and Canada from 1855 to 1865. This policy was at that time terminated by the states themselves, and never resumed, although at the time of his death many leading Canadians desired to be embraced in the treaties to promote commerce which were being executed between the federal government and various other American states.

Macdonald (*măk-dō-năl'*), **Etienne Jacques Joseph Alexandre,** Marshal of France, was born Nov. 17, 1765, at Sancerre. He entered the army in 1784, and became a general in 1795, after having distinguished himself at Jemappes and also by crossing the Waal on the ice under the fire of the enemy. In 1800 and in 1801 he commanded the army of reserve in Switzerland, but in 1805 he lost the favor of Napoleon by his support of Moreau. Four years later, however, Napoleon placed him in command of the right wing of the army of Italy, and he so distinguished himself at the battle of Wagram that he was created marshal and also duke of Tarentum. In 1813, he was defeated by Blücher at the Katzbach, and at the battle of Leipsic he assisted to cover the retreat of the French. He adhered firmly to Napoleon until the latter's abdication; but during the "hundred days" refused to take any command under him. He lived in honorable retirement at Courcelles, near Guise, until his death, which took place Sept. 25, 1840. See *The Consulate and the Empire*, by Thiers.

Macdonald (*măk-don'ald*), **Flora,** a Scottish heroine, was born in the Isle of South Uist, one of the Hebrides, in the year 1722. She lost her father at the age of two years, and four years later her mother married Hugh Macdonald, of Armadale, in the island of Skye. Flora, however, was left behind in Uist for a number of years, but obtained three years' schooling at Edinburgh. After the defeat of Prince Charles Edward Stuart at Culloden, in the spring of 1746, under the disguise of "Betty Burke, the Irish woman," he was conducted by Flora from Ormiclade in Beubecula to Monkstadt in Skye, and thence by way of Kingsburgh to Portree, where the prince was committed to the care of Macdonald of Kingsburgh. They encountered great dangers, but Flora's wit and courage saved the young prince from capture and brought their voyage to a successful issue. She was soon after arrested by the government for her part in this affair, and held in mild captivity for about a year, during which she received a great deal of honor and attention from leading Jacobites. In 1750, she married the son of Macdonald of Kingsburgh, and became the mother of several children. They moved to North Carolina in 1774, and when the Revolutionary war broke out, her husband was commissioned a brigadier-general in the British service — her five sons were also British officers. Flora returned to Scotland in 1779 with her younger daughter, and during the voyage took part in an engagement between the vessel in which she sailed and a French privateer. Two years later, she was joined by her husband in Scotland, where they lived until her death, which took place in a neighbor's house at Kingsburgh, March 5, 1790. She was buried at Kilmuir in one of the sheets of the bed in which Prince Charles Edward slept the night he passed at Kingsburgh. Dr. Johnson, who was entertained by Flora in 1773, describes her as a woman "of middle stature, soft features, gentle manners, and elegant presence." He also says that "her name will be mentioned in history, and if courage and fidelity are virtues, mentioned with honor." See *Autobiography*.

Macdonald (*mak-dŏn'ald*), **George,** LL.D., a Scotch poet, novelist, and preacher, was born at Huntly, Aberdeenshire, Scotland, 1824; educated at King's college and Aberdeen university, studying subsequently at the Independent college, Highbury, London, for the nonconformist ministry. He preached for a short time in the counties of Surrey and Essex, but later became a lay member of the Church of England and devoted himself to literature. He visited the United States in the years 1872–73, lecturing and preaching in various cities. He published volumes of poems in 1855, 1857, 1864, 1868, and 1882. He also published a large

GEORGE MACDONALD.

number of novels, among which are *David Elginbrod; Adela Cathcart; Annals of a Quiet Neighborhood; Robert Falconer; Wilfrid Cumbermede; Malcom; The Marquis of Lossie; Sir Gibbie; Mary Marston; What's Mine's Mine; The Flight of the Shadow; The Light Princess; Lilith*, etc. His religious and theological works, including *The Hope of the Gospel, Gifts of the Child Christ*, etc., are not so well remembered; but some of them attracted no little attention at the time of their publication. His stories are of unequal merit, the *Annals of a Quiet Neighborhood* and *Wilfrid Cumbermede* being perhaps best known.

McDonough (*mak-dŏn'ō*), **Thomas,** an American naval officer, born in Delaware, Dec. 23, 1783. He became a midshipman in the navy in February, 1800, and belonged to the crew of the frigate *Philadelphia*, which was one of the squadron employed against Tripoli in 1803. He afterward served in the *Enterprise*, commanded by Decatur, and participated in the various attacks upon Tripoli in 1804. In 1814, during the second war with Great Britain, he commanded a squadron on Lake Champlain, and gained a decided victory over a British squadron under command of Captain George Downie. For this service he was promoted to the rank of captain and was presented with a gold medal by Congress. The legislature of Vermont also gave him an estate overlooking the scene of the engagement. He died at sea, Nov. 16, 1825.

McDow'ell, Irvin, a United States soldier, born in Franklin county, O., Oct. 15, 1818. He graduated at West Point Military academy in 1838; and during the Mexican war was brevetted captain for his gallant conduct at the battle of Buena Vista. At the opening of the Civil war, in 1861, he was commissioned brigadier-general, and placed in command of the army organized for an advance upon Richmond. His plan of the battle of Bull Run was without fault, and his conduct all that could be desired in a general; but he was unable to arrest the retreat of his troops, when they became panicstricken in the afternoon; and for some time after, McDowell was made the object of severe and unjust criticism. He was afterward placed in command of an army corps under McClellan and Pope, and was with the latter at the second battle of Bull Run, Aug. 29–30, 1862. He died at San Francisco, May 5, 1885.

Macduff', a Scottish nobleman (thane), and one of the leading characters in Shakespeare's immortal play of *Macbeth*.

McDuf'fie, George, a South Carolina statesman, born in Columbia county, Ga., in 1788. He began the practice of law at Edgefield, South Carolina, in 1814, and four years later was elected a member of the state legislature. In 1821, he became a member of Congress, and during the years he served in that body distinguished himself as an opponent of the protective tariff and an advocate of state-rights. He retired from Congress in 1834, after a bitter and vehement speech against the administration of President Jackson, and in the same year he was elected governor of South Carolina. When his term of office expired, he retired to private life, but, in 1842, he was chosen United States senator by the legislature of the state. Failing health compelled him to resign this office in 1846, which was the termination of his public career. He died in South Carolina, March 11, 1851.

Mace, the aril or inner covering of the nutmeg. It is blood-red, and somewhat fleshy when fresh. It is prepared for market by drying for some days in the sun. Mace is used as a spice, and its flavor is very similar to that of the nutmeg. It is imported chiefly from Penang and Singapore, where it is received from the Spice islands.

Macedo'nia, originally the name of a small country in Europe, lying north of Thessaly and the Ægean sea. Perdiccas I., about 700 B. C., is reputed to be the first king of Macedon, but it was not until the accession of Philip, 359 B. C., that the power of Macedon began to be felt by Greece and other nations. Philip applied himself very vigorously to developing the resources of his kingdom, and laid the foundations of the greatness it afterward assumed. His son, Alexander the Great, conquered Persia and brought half the known world under his sway; but a few years after his death the Macedonian empire was divided into four kingdoms under his principal generals. In 168 B. C., Macedonia was conquered by the Romans, and twenty-five years later was made a Roman province. The country is now under the dominion of Turkey.

Maceo (*mȧ'sā-o*), **Antonio,** a mulatto officer of the insurgent army in Cuba, was born at Santiago, Cuba, July 14, 1848. His family were people of humble position in the island, but inclined to side with the officers sent over from Spain. But upon the death of a brother, ruthlessly slain by a Spanish officer, he and his brother Josef joined the insurgents, and both rose to positions of great influence. His career during the ten years' war, 1868–78, displayed natural abilities as a soldier, and at Guimaro he defeated the Spanish troops under General Weyler. At the conclusion of peace, signed at Zanjon, 1878, he refused to accept the conditions, and retired to Costa Rico, Central America, where his time was mostly spent in preparation for a renewal of the war. He attempted, though unsuccessfully, to start another revolution in Cuba in 1890. He took part actively in the uprising of 1895, and, second only to Maximo Gomez, was rated the ablest of the insurgent leaders. He was killed by the Spanish troops in a skirmish near Mariel, Cuba, Dec. 2, 1896.

Macfarren (*mak-fär'en*), **Sir George Alexander,** English musical writer and composer, was born at London, March 2, 1813. He was educated at the Royal Academy of Music, and became a professor in that institution in 1834. In 1875, he was appointed principal of the academy, and also professor of music at Cambridge university. He was knighted in 1883, and died at London, Oct. 31, 1887. Macfarren's musical works are quite numerous; but he stands higher as a writer on the theory of music than as a musical composer — his aim being to revive the old English music in modern opera.

Macgreg'or, John, English canoeist, traveler, and philanthropist, was born at Gravesend, Jan. 24, 1825. He was educated at Trinity college, Cambridge, where he graduated with high honors in 1847. His love of travel caused him to make a tour through Europe, Egypt, and Palestine in 1849–50, and a few years later he also visited Canada and the United States. The rise of canoeing in England since 1850 was largely due to his influence and example. In 1866, he published an account of a canoe journey under the title of *A Thousand Miles in the Rob Roy Canoe*, which was followed by narratives of canoe voyages on the Baltic and Zuyder Zee, and by canoe trips on the Jordan, Red sea, and lake of Gennesareth. The profits of his lectures and works, amounting to over $500,000, he turned over to various philanthropic institutions. He died at Bournemouth, England, July 16, 1892.

Machiavelli (*mäk-i-ä-vĕl'i*), **Niccolo di Bernardo dei,** Italian statesman and diplomatist, was born at Florence, May 3, 1469, and died there, June 22, 1527. It was during the early years of his life that the Medici fled from Florence, and the republic was established under the influence of the great reformer Savonarola. In 1498, Machiavelli was appointed secretary to the body of ten men chosen to direct the civil and military affairs of the government. This position, which was one of great importance, Machiavelli held for fourteen years, during which he was sent on a large number of foreign embassies. On the restoration of the Medici, in 1512, he was arrested on a charge of conspiracy, and put to the torture to induce a confession. He denied all knowledge of the conspiracy charged against him, but although released he was obliged for several years to withdraw from public life and betake himself to literature. After the defeat of the French by Charles V., at Pavia in 1525, Machiavelli was very active in arousing his countrymen to resist the advancing army of the Spanish emperor. In May, 1527, the Florentines again drove out the Medici rulers and proclaimed the republic; but Machiavelli was so distrusted by them that he was not allowed to take any active part in the movement for liberty. This disappointment, added to his already feeble health, brought on an illness of which he soon died. Machiavelli's writings comprised several volumes, his most important work being *Il Principe*, commonly called "The Prince." The purpose of this book is to reveal the means by which princes and rulers may maintain authority over their subjects; and the author boldly lays down the doctrine that in order to sustain their power rulers may use all possible means, including fraud and treachery. The principles taught in this book may be traced in a large measure to the peculiar nature of European politics in Machiavelli's time; but it nevertheless reveals a defect of moral sense in the author that is all the more to be deplored on account of his talents and great services to the state. See *Life*, by Villari; *Florentine History*, by Napier.

McKees'port, Pa., a city in Allegheny county, in southwestern Pennsylvania, the center of an extensive bituminous coal trade and commerce in natural gas, which abounds in the region. It is situated ten miles southeast of Pittsburg, on the Monongahela river at the mouth of the Youghiogheny, on the Baltimore and Ohio, the Pennsylvania, and the Pittsburg and Lake Erie railroads. It has a large number of manufacturing industries, among them being the largest wrought-iron pipe works on the continent, with ample capital and employing over 6,000 hands. There are establishments engaged in the manufacture of iron and steel, locomotives, railroad cars, glass works, lumber mills. The city also has a considerable river trade. Population, which has of late largely increased, 34,227.

McKen'na, Joseph, an American lawyer and jurist, was born at Philadelphia, Pa., Aug. 10, 1843. At the age of twelve he removed to California with his parents. He was educated at the college of St. Augustine, Benicia, studying law after his graduation and being admitted to the bar in 1865. He was soon after elected county attorney of Solano county, and in 1875 was sent to the state legislature. Although twice defeated for congress, he ran again in 1884 and was elected, serving four consecutive terms. During his life in congress he was an intimate friend of Mr. McKinley and assisted in the framing of the McKinley tariff (1890). He succeeded Judge Sawyer upon the circuit bench of the Pacific slope in 1892, appointed by President Harrison, and remained there until called by President McKinley to a seat in his cabinet as attorney-general. In 1897, he was appointed by the now deceased President to the vacancy in the supreme court, succeeding Justice Field.

Macken'zie, the largest river in British America. It rises as the Athabasca in British Columbia, flows over 600 miles into Athabasca lake and thence as the Slave river 240 miles to Great Slave lake. It now assumes the name

of Mackenzie river, and flowing northward in a course of 1,000 miles empties into the Arctic ocean. The Mackenzie received its name from Sir Alexander Mackenzie, by whom it was discovered in 1789. Sir John Franklin descended it in 1825.

Mackenzie (*ma-ken'zi*), **Alexander,** a Canadian statesman, was born near Dunkeld, Scotland, Jan. 28, 1822. He moved to Canada in 1842, engaging in business as a contractor until 1861, when he was elected to the assembly of Canada, remaining in the same until the formation of the Dominion parliament, to which he was also elected, representing the same constituency for 25 years. He was offered a seat in the Canadian cabinet in 1865, but declined it. Upon the resignation of Sir John Macdonald he became premier of the Dominion and minister of public works. Upon the election of a conservative majority to parliament in 1878, he, with his cabinet, resigned his position. At various times he visited his native country and was treated everywhere with distinction, being offered knighthood three times, but each time he declined the honor. He visited the queen at Windsor in 1881. Possessed of great ability as an administrator and of splendid gifts as an orator, his influence throughout the Dominion is still felt. He died at Toronto, April 17, 1892.

Mackenzie (*ma-ken'zi*), **Alexander Campbell,** musical composer, was born at Edinburgh in 1847. He studied music in Germany in his early years, and afterward at the Royal academy in London. After devoting many years to his art, in Edinburgh and in Italy, he was appointed principal of the Royal Academy of Music at London, and in 1892 became conductor of the Third Harmonic Society's concerts in London; and three years later he was knighted. His works embrace almost every form of music, his celebrity dating from the production of his opera *Colomba* at Drury Lane in 1883.

Macken'zie, Sir Morell, M. D., was born in 1837 at Leytonstone, England, and studied at the London Hospital Medical college, at Paris and Vienna. In 1863, he founded the Hospital for Diseases of the Throat, at London, and in the same year his essay on *Diseases of the Larynx* won for him the Jacksonian prize from the Royal College of Surgeons. Not long after, he was elected as assistant physician to the London hospital, then became full physician, and later was appointed lecturer on diseases of the throat, which appointment he held at the time of his death. He attended on the late German Emperor Frederick during his last illness. In 1888, Dr. Mackenzie published *The Fatal Illness of Frederick the Noble*, in vindication of his treatment. He was a corresponding member of the Imperial Royal Society of Physicians of Vienna and of the Medical Society of Prague, and an honorary fellow of the American Laryngological association. He was the author of a systematic treatise, in two volumes, on *Diseases of the Throat and Nose*, which has been translated into French and German, and is well known in America. He died at London, Feb. 3, 1892, after an illness of only a few days.

Mack'erel, an important food fish living in the North Atlantic from Cape Hatteras north to Labrador and Newfoundland. It is steel blue above with dark bars, and silvery beneath. They attain a length of seventeen or eighteen inches, or even longer; but the average length of those caught for the whole coast is about twelve inches. Their food is small crustacea, the spawn and young of other fishes, and jellyfish. They occur in large schools, and many vessels of fine modern construction are engaged in the mackerel fishery. They are caught with hooks and lines, and also with nets. They are salted and very extensively used as food. In a single year (1898) the market price of those landed at Boston and Gloucester amounted to nearly three million dollars.

Mackinaw or **Mackinac** (*mak'in-aw*), an island three miles long and two miles broad in the Strait of Mackinaw, which connects Lake Huron and Lake Michigan. The village of Mackinaw, on the island, is the seat of Mackinaw county, and is noted as a fashionable summer resort. Fort Mackinaw is situated on a rocky eminence, overlooking the village and commanding the strait. Population 564.

McKinley, William, twenty-fourth President of the United States, was born at Niles, O., Jan. 29, 1843. He was educated at public schools, the Poland academy, and Allegheny college. For a short time he taught school, but in the first summer of the Civil war, when still but eighteen years of age, he enlisted as a private in the 33d Ohio volunteer infantry. The next year he was made second lieutenant; the following year, first lieutenant; and captain in 1864. He was brevetted major by President Lincoln for gallantry in the field, March 13, 1865. He served on the staffs of Generals Rutherford B. Hayes, George Crook, and Winfield Scott Hancock. When mustered out, July 26, 1865, he was assistant adjutant-general, 1st division, 1st army corps. He began the study of law upon his retirement from military service; took a course at the Albany (N. Y.) Law school; was admitted to the bar in 1867, and settled at Canton, O., in

WILLIAM M'KINLEY.

the same year, which place has since been his home. Being elected to Congress in 1876, he served continuously in the house until March, 1891. As chairman of the committee on ways and means, he reported to congress the Tariff bill of 1890, known since as the "McKinley bill," taking advanced ground in favor of a high tariff. He was elected governor of the state in 1891, and re-elected in 1893. In 1896, he was nominated for President by the Republicans and was elected, receiving in the electoral college 271 votes, as against 176 cast for William J. Bryan. The issue for that year was for or against "free coinage of silver," Mr. McKinley opposing and Mr. Bryan favoring the same. The first year of his administration was marked by the stirring events and the diplomatic steps which led to the intervention of the United States on behalf of the oppressed Cubans. Early in the second year, war with Spain was declared (April 20, 1898). An army of 200,000 men was called out and speedily organized and equipped and the battles of the war were fought, beginning with the naval victory in Manila Bay, May 1st and closing with the surrender of the Spanish army at Santiago, July 14th. By subsequent treaty, Spain ceded to the United States Porto Rico and the Philippine Islands. A revolt of the Filipinos under Aguinaldo led to a protracted struggle which was not ended when the campaign for the succeeding presidential election occurred in 1900, and naturally this election turned largely upon the causes, the conduct, and the results of the war. Mr. McKinley was again elected President, November, 1900, a second time defeating Mr. Bryan, who was again the nominee of the Democratic party. Meantime the United States had taken a prominent part in the capture of Tien-tsin and Peking, China, relieving the legations without a declaration of war. The struggle in the Philippines was brought to a close early the next year and military rule was superseded by the establishment of civil government, July 4, 1901. In meeting the grave questions which arose during a period fraught with events of far-reaching importance to the nation, Mr. McKinley displayed high qualities as a statesman and political leader, and gained the esteem of men of all parties as a pure, able, and patriotic executive. While he was attending the Pan-American Exposition at Buffalo, an attempt was made on the life of President McKinley by an anarchist, Leon F. Czolgosz, during a public reception held in the Temple of Music in the exposition grounds, Sept. 6, 1901. Czolgosz took his place in the line of those who were shaking hands with the President, and, as he presented his left hand to the President, fired two shots from a pistol which he held in his right hand concealed by a handkerchief. One shot was not serious, but the other proved fatal. By prompt and skillful surgical attention, the dreaded result was for a few days averted, but the end came in the early morning of Sept. 14. The death of the beloved President and revered chief of the state, under such cruel circumstances, fell with instant and crushing effect upon the nation, and hushed to an awed silence its activities, and, for the time, even its life-breath. Foreign sympathy for the country's loss was also profound and widespread, for Mr. McKinley was held in high regard abroad, as he was widely, sincerely, and deservedly loved at home. His painstaking and tireless devotion to the duties of the executive office, his patriotism which was above all personal ambition, his wise guidance of the nation through grave perils to a height of prosperity before unknown, the purity of his personal character, the warmth of his friendship, and the courage and Christian resignation displayed in the closing hours of his life, combine to give to William McKinley an honored place in the records of the nation. His body was taken to Washington, where an impressive funeral service was held in the rotunda of the capitol, thence was carried to Canton, Ohio, where his burial occurred, Sept. 19, 1901.

Maclar'en, Ian. (See WATSON, REV. JOHN.)

Macleod (*mak-lowd'*), **Norman,** a minister of the church of Scotland, distinguished for his pulpit oratory and liberal Christianity, was born at Campbelltown, Argyllshire, June 3, 1812. He was educated at Glasgow university and was minister there until his death, June 16, 1872. His writings and sermons are at once charming and instructive, full of shrewd observation and good humor. His nature was large, and yet very childlike; manly, but full of tenderness and sympathy; and being very broad and catholic in all his views, his influence in the religious world was both widespread and beneficent. He published *Parish Papers*, *Wee Davie*, *The Starling*, and *Character Sketches*.

Maclise (*mak-lēs'*), **Daniel,** an eminent painter, was born at Cork, Feb. 2, 1806. He went to London in 1828, and entered the school of the Royal academy, where he won all the prizes for which he competed. In 1833, he made himself famous by his *All Hallow Eve*. His works are very numerous, and many of them have become quite familiar through engravings. *The Death of Nelson* and *The Meeting of Wellington and Blücher after the Battle of Waterloo* were admitted to be the finest mural paintings hitherto executed in England. He died at London, April 25, 1870.

Maclure (*mak-lūr'*), **William,** the "father of American geology," was born at Ayr, Scotland, in 1763, but settled in the United States in 1796. In 1803, he went to Europe as one of the commissioners to adjust the claims of American citizens against France for losses of property sustained during the revolution in that country. While in Europe he gave a great deal of attention to the geology of that continent, and on returning undertook a private

geological survey of the United States. He visited nearly every state and territory, crossing the Allegheny mountains a great many times on foot. At Philadelphia, he was long president of the Academy of Natural Sciences. He died near Mexico, in 1840.

McMahon (*mäk-mah-on'*), **Count Marie Edme Patrice Maurice,** ex-president of the French republic, was born at Sully, near Autun, Nov. 28, 1808. Entering the army at an early age, he saw active service in Algeria, especially distinguishing himself at the storming of Constantine, in the year 1837. He commanded the division that stormed the Malakoff at Sebastopol during the Crimean war, and in the Italian campaign of 1859 was created a marshal of France for the decisive part he took in the battle of Magenta. In the Franco-German war of 1870, he commanded an army corps, and although defeated and captured at Sedan, his military reputation remained untarnished. At the close of the war he was made commander of the army of Versailles, with which he suppressed the commune that held sway in Paris during many weeks. On the retirement of M. Thiers from the presidency of the republic, in 1873, Marshal McMahon was chosen his successor for a term of seven years, but resigned the position Jan. 30, 1879. He died at Paris, Oct. 18, 1893.

McMas'ter, John Bach, Ph. D., Litt. D., an American scholar and writer, was born at Brooklyn, June 29, 1852. He was educated in the public schools of New York, graduating at the College of the City of New York in 1872. Having first made a specialty of civil engineering, he was called to be instructor in the same in Princeton college, 1877, remaining there until 1883. In this year he was appointed professor of American history (to which study he had devoted his later years), at the University of Pennsylvania. His first published work, *Bridge and Tunnel Centres*, came out in 1876, but in 1883 he issued the first volumes of an important *History of the People of the United States*, the fourth volume of which appeared in 1895. The fifth volume did not issue from the press until five years later. He has also published a *Life of Benjamin Franklin; The Origin, Meaning, and Application of the Monroe Doctrine*, etc.

McMon'nies, Frederick William, an American sculptor, was born at Brooklyn, N. Y., Sept. 28, 1863. He studied art in the rooms of Augustus St. Gaudens, and subsequently pursued his course at Paris, London, and Munich. His best-known work was the great fountain in the principal court of the Columbian Exposition at Chicago. He also modeled the statue of Nathan Hale, which was erected in the City Hall park, New York, as well as several other public monuments. Among his later productions are the bronze doors and a statue of Shakespeare for the Congressional library, Washington, D. C. He received the Decoration of the Legion of Honor from the French government in 1896.

McNab', Sir Alan Napier, a Canadian soldier and statesman, was born at Niagara, Canada, Feb. 19, 1798. He served in the expedition against Sackett's Harbor in 1813; and later was in command of the English forces in their assault upon Plattsburg. At the close of the war he returned to Canada, studied law, and was admitted to the bar, residing at Hamilton. He was elected to the assembly of Upper Canada in 1830, subsequently becoming speaker of the house. During the insurrection of 1837–38 he was in command of the Canadian forces, with the rank of colonel. His energetic measures at that time soon dissipated the forces against him. He seized, burned, and sent over the falls the American steamer *Caroline*, which was engaged in conveying supplies to the rebels from the American side. After various further services, legislative and executive, being prime minister from 1854 to 1856, he died at Toronto, Aug. 8, 1862.

Ma'con, Ga., the capital of Bibb county, on the Ocmulgee river, in central Georgia, traversed by nine or ten lines of railway that interlace the state. It has many manufacturing establishments, representing various industries, the chief of which are those devoted to textile fabrics, together with a large commercial trade. It has many schools, churches, a public library, and is the seat of Mercer (Baptist) university, the State Academy for the Blind, the Alexander Free school, the Jones Home for Indigent Women, besides other educational and charitable institutions. Population 23,272.

Ma'con, Nathaniel, a North Carolina statesman, was born in Warren county, of that state, in 1757. He served as a private soldier in the Revolutionary war, and was a member of the state legislature from 1780 to 1786. He was a member of congress for twenty-four years, from 1791 to 1815, and of the United States senate for the thirteen following years, making a continuous service in congress of thirty-seven years, the longest on record. He died at his home in Warren county, N. C., June 29, 1837.

Macpher'son, James, a Scottish author, the alleged "translator" of the Ossianic poems, was born at Ruthven, Inverness-shire, Oct. 27, 1736. He was educated at King's college, Aberdeen, giving evidence of a taste for poetry while pursuing his course of study. In his 20th year he published a poem entitled *The Highlander*, and two years later published a small volume of fragments purporting to be translations of ancient Celtic poetry. These fragments excited so much interest that money was raised to send Macpherson on a tour through Scotland to collect more of the same. He accordingly visited the mainland and islands inhabited by the Gaelic

race, and in 1762 published "*Fingal*, with other poems composed by Ossian, and translated from the Gaelic," and this was followed the next year by "*Lemora*, with other poems, by Ossian." These poems were read with great interest, but a strong party soon arose to question their genuineness and the controversy over their authenticity has hardly yet ceased. Macpherson entered parliament in 1780, and sat as a member of that body for the next ten years. He died upon his estate in Inverness-shire, Feb. 17, 1796, his body being interred in Westminster Abbey at his own expense, and in accordance with his own request. See *On the Authorship of Ossian's Poems*, by Sinclair.

McPher'son, Gen. James B., was born in Sandusky county, O., Nov. 14, 1828, and graduated at West Point Military academy at the head of his class in 1853. In August, 1861, on account of his superior qualifications as an engineer, he was promoted to the rank of lieutenant-colonel and placed on the staff of General Halleck, commanding the department of the Missouri. In his capacity as staff officer General McPherson was with General Grant at Forts Henry and Donelson, at Shiloh, and at the siege of Corinth, rendering service that was gratefully acknowledged by that general; and during the Vicksburg campaign, in 1863, he commanded the 17th army corps which so successfully fought the battles of Raymond and Champion Hill. During Sherman's Atlanta campaign, McPherson commanded the army of the Tennessee, displaying the highest soldierly qualities in every engagement until he was killed in the battle before Atlanta, July 22, 1864. General McPherson was tall and rather imposing in appearance, but very gentle and unassuming in his manners, and his death was deeply lamented by all the officers and soldiers in his command. "To know him was to love him," was the high tribute paid to him by General Grant.

GENERAL M'PHERSON.

Macready (*mȧk-rē'dĭ*), **William Charles**, an English actor, was born at London, March 3, 1793. At an early age he was sent to Rugby to be educated for the bar, but his father's financial embarrassments forced him to adopt the stage as his profession. He made his first appearance as "Romeo" at Birmingham at the age of seventeen. Six years later, Sept. 16, 1816, he made his London début, playing "Orestes" at Covent Garden, and after several years of patient effort took rank among the leading English actors. In December, 1837, he inaugurated his famous Covent Garden management, during which he did much to improve and elevate the English stage. Macready made a number of visits to the United States, during the last of which a riotous mob, trying to break into the Astor place for the purpose of attacking him, was fired upon by the military and several lives were lost. Macready took his farewell of the stage at Drury Lane, Feb. 26, 1851, and passed his remaining days in retirement at Sherborne and Cheltenham; at the latter place he died April 27, 1873. As an actor Macready sought to combine the dignity of the Kembles with the naturalness of Kean. In addition to being an actor of great power, he was a man of fine literary taste and of pure, elevated character. See *Biography*, by Littleton.

Macrosporangium (*mȧk'ro-spo-rȧn'jĭ-ŭm*) (in plants). See MEGASPORANGIUM.

Macrospore (*mȧk'ro-spōr*) (in plants). See MEGASPORE.

Macrosporophyll (*mȧk'rō-spor'o-fĭl*) (in plants). See MEGASPOROPHYLL.

MacVeagh (*mȧk-vȧ'*), **Wayne**, lawyer and diplomat, was born near Phœnixville, Chester county, Pa., April 19, 1833. He graduated at Yale in 1853, and received the degree of doctor of laws from Amherst, 1881, and from the University of Pennsylvania in 1897. He was admitted to the bar in 1856, and three years later was elected district attorney of his native county, where he served till the outbreak of the Civil war. He was commissioned a captain of infantry in 1862, and major of cavalry in 1863. Mr. MacVeagh was appointed minister to Turkey by President Grant in 1870. In 1873, he was sent as the head of the commission intrusted by President Hayes with the duty of bringing order out of the political chaos of Louisiana. He became attorney-general in the cabinet of President Garfield, but resigned upon the inauguration of President Arthur. Mr. MacVeagh supported Grover Cleveland for president in 1892, and was sent by Mr. Cleveland as minister to Italy in 1893. For a number of years he was a prominent leader of the Civil Service Reform association of Philadelphia and a leader among independent Republicans. He was also an active member of the Indian Rights association.

Madagascar (*mȧd-a-gȧs'kar*), a large island off the southeast coast of Africa, from which it is separated by Mozambique channel. Madagascar is the third largest island in the world, reckoning Australia as a continent, being 975 miles in length, and its greatest breadth is 358 miles. Its total area is a little over 28,500 square miles. Madagascar consists of an elevated region in the center, from 3,000 to 5,000 feet above the level of the sea, and a nearly level country surrounding the

high land. The island is also surrounded with a belt of forest from 10 to 40 miles wide. The capital city, Antananarivo, is situated near the center of the island, and contains about 260,000 inhabitants. The chief ports are Tamatave, on the east coast. (population 6,000), and Majungà, on the northwest coast (about 250 miles distant from the coast of Africa), population 6,000. English missionaries first entered Madagascar in the year 1820, and were greatly encouraged in their work by King Radàma, but when Queen Ranavalona I. came to the throne, in 1828, a severe persecution followed, and they were compelled to leave. A great many native Christians were put to death, and Europeans generally were excluded from the island. But on the death of the queen, in 1861, there was a complete change in the policy of the government and since that time the people have made great progress in religion, as well as in all the arts of civilization. In 1879, all the African slaves on the island were set free, and considerable effort has been made to improve the military system and reduce the administration of law to a fixed and equitable system. In 1896, Madagascar, together with Nossi-Bé and Ste. Marie Islands, was proclaimed a French colony, though a French resident general had been received at the capital as far back as 1885. In February, 1897, the native queen was deposed by France and deported to the island of Réunion, and subsequently to Algiers. France now rules the island entirely, under a governor-general, aided by an administrative council. Many parts of the island are known to be rich in mineral ores. The chief exports are rubber, rice, hemp, and other fibres. The population of Madagascar is between 2,500,000 and 3,000,000.

Madeira (*ma-dē'ra*), an island belonging to Portugal, in the Atlantic ocean, off the northwest coast of Africa, about thirty-two miles long and from ten to fifteen miles broad. The island (area 505 square miles) is of volcanic origin, and is occasionally visited by earthquakes. It is traversed by a mountain chain running east and west; and the coasts are steep and rough, affording few harbors. Wine is the product for which Madeira has long been noted, several kinds of grapes being produced on the island. The vines were much injured by the grape disease in 1852; but they were soon replanted and only one failure of the crop has been recorded in the past twenty-five years. The value of the wine exported is nearly $1,000,000 a year. There is also a considerable export of sugar. The inhabitants of Madeira, estimated at 135,000 in number, are a mixture of Portuguese, Moors, and negroes, and are described as a vigorous, industrious, and peaceful race. The capital, Funchal (population 19,000), is the chief seaport, and a noted health-resort. Its situation is in lat. 32° 38′ N., long. 16° 54′ W. The Madeira islands began to be colonized by the Portuguese about the year 1420; they were occupied by the British in 1801, and from 1807 to 1814.

Madei'ra, a river of South America, and the largest tributary of the Amazon, is formed by the junction of the Mamoré and Guaporè in Bolivia, the Beni joining about 100 miles lower down. The river then flows northeast to the Amazon, its drainage basin embracing nearly 500,000 square miles. From its mouth to its first falls the distance is nearly 600 miles; and above this point navigation is rendered impossible by a series of falls and cataracts extending over 200 miles. The length of the river, including its tributaries, is about 2,000 miles.

Mad'ison, a city of Indiana, the capital of Jefferson county, is situated on the right bank of the Ohio river, 90 miles below Cincinnati and 50 miles above Louisville, Ky., with which two cities it has daily communication by steamer. Population 7,835.

Mad'ison, the capital of Wisconsin, is located in Dane county, on an isthmus between Lakes Monona and Mendota, 80 miles west of Milwaukee and at the junction of several railroads. The capitol, State university, and other public buildings stand on hills, commanding extensive views of beautiful scenery. The university is in a 13-acre park, is open to both sexes, has a faculty of 100 members and 2,000 students. It has an income of over $100,000, arising from a state tax of ⅛ mill on the dollar. The Washburn observatory, built in 1878–80, at a cost of $30,000, was given to it, with a full equipment, by Governor C. C. Washburn. Many summer visitors are attracted to this charming little city, by its pure springs, bass fishing, boating of all kinds, beautiful drives, and Chautauqua assemblies. It has also a large number of manufactories. Population 19,164.

Mad'ison, James, fourth President of the United States, his two terms extending from 1809 to 1817, was born at Port-Conway, Va., March 16, 1751, and graduated at Princeton college in 1772. He was elected to the Continental congress in 1780, and in 1784 to the legislature of Virginia, in which he was largely instrumental in securing the fullest religious liberty to the people of the state. He was also one of the leading spirits in the convention of 1787, which framed the constitution of the United States; and it was in a great measure due to his influence

JAMES MADISON.

that the instrument was ratified by the legislature of Virginia. Madison was a member of congress during Washington's administration; and although he retired to private life when John Adams became President in 1797, he was the author of the "Resolutions of 1798," adopted by the legislature of Virginia in opposition to the famous alien and sedition laws of the Adams administration. During Jefferson's administration, from 1801 to 1809, Madison filled the office of secretary of state with such ability that he was chosen Jefferson's successor and inaugurated President, March 4, 1809. The principal feature of his administration was the War of 1812 between Great Britain and the United States, which was terminated by the treaty of Ghent, Dec. 14, 1814, although the battle of New Orleans was fought on the 8th of January following. On retiring from the presidency, Mr. Madison took up his residence at Montpelier, Va., where he died June 28, 1836. While not distinguished for brilliancy of intellect or great oratorical powers, Madison was a pure and able statesman, and was well worthy of the universal respect accorded to him. See *Life*, by Adams; *Life and Times*, by Stoddard.

Madoc (*mād'oc*), a Welsh prince, who is believed by his countrymen to have discovered America three hundred years before Columbus. It is said that he sailed westward in 1170 with a small fleet, and, after a voyage of several weeks, reached a country whose inhabitants and productions were very different from those of Europe. After remaining for some time in this new country, he returned to Wales and equipped another fleet, with which he set sail and was never heard of again. The story of Madoc will be found in Lloyd and Powell's *Historie of Cambria*. Southey has made the legend the subject of one of his poems.

Madras (*ma-drās'*), the capital of southern India (Madras presidency), is on the coast of the sea of Bengal, which washes the eastern coast of the presidency about 225 miles north of Ceylon. It is the center of all the great military roads of India, is also the terminus of two railway lines, and is connected with a system of canals. Although it has not a single handsome street, there are several buildings of fine architecture and many spots of historical interest. Nearly all the most important offices and the headquarters of every department of the presidency are located here. The garrison of Madras is about 3,500 strong, of whom 1,200 are Europeans. Notwithstanding its exposed situation, Madras ranks third among the ports of India in the number and tonnage of vessels calling, and the value of its imports and exports. The port trades with every part of the world, exporting coffee, cotton, grain, hides, indigo, oilseeds, dyes, sugar, and horns, and importing iron and other metals and all kinds of European manufactures. The lighthouse, 125 feet high, can be seen from a ship's deck 15 miles at sea. The city of Madras dates from 1639. It is liable to be swept by furious hurricanes, which occur some years at the beginning of the monsoons in May and October. The present population is 452,518, about three-fourths of whom are Hindus. Over 50,000 are Mohammedans, 13,000 are Eurasians, and about 4,000 are Europeans. Madras presidency has an area of 141,189 square miles, with a population of 39,630,440. It comprises the eastern or Coromandel coast, a large part of the interior of the Deccan, and part of the western or Malabar coast. Its mountain ranges are the east and west Ghats, and it is watered by the Godavari, Kistna, and Kavari rivers.

Madrid (*ma-drid'* or *mā-drēd'*), the capital city of Spain, is situated on the left bank of the Manzanares, 880 miles by rail from Paris. It is built on a treeless plateau 2,000 feet above the sea level; and its sole recommendation as a capital would seem to be its central position in the peninsula. When Madrid was declared the capital of Spain by Philip II., in 1561, it contained about 30,000 inhabitants. At the beginning of the 19th century the population numbered 160,000; in 1860 it was 298,000, and in 1897 over 512,000.

Maelstrom (*māl'strŭm*), a famous whirlpool, or rather current, in the Arctic ocean, between Mosken and Moskerra, two of the Lofoden isles, on the northwest coast of Norway. Vessels can pass through this strait at high tide and low tide, although in one place there is always a rough sea, the water being churned into angry foam. The stories of ships being swallowed up are mere fables, although a ship fully under the power of the current might be dashed against the rocks on either side. The current takes twelve hours to complete a circular revolution.

Maestricht (*mās'trikt*), capital of the Dutch province of Limburg, in the Netherlands, 19 miles by rail from Liège, and 152 from Amsterdam. It lies on the left bank of the Meuse, a stone bridge connecting it with Wijk. It was formerly a fortress, but is now only a garrison town, the fortifications having been dismantled in 1871–78. Population in 1899, 34,620.

Mafia (*mā-fē'a*), a Sicilian order, or secret society, which gradually came to suppiant the authority of the state by its own decrees, which are enforced even at the cost of life itself. Its organization does not appear to be of a very definite nature; but its power is undoubted and pervasive. It controls elections, affords protection against the officers of justice, and practically renders it impossible for those not members of its order to secure employment upon the island. Boycotting, its usual weapon, is suplemented by violence whenever occasion may seem to demand it. Nearly all crimes of violence which occur in

any part of Italy are laid at its door, with how much truth in particular cases it is impossible to say. In the United States there is little doubt it has its own secret agents, as murders in the Italian quarters of our American cities are seldom traced to their real perpetrators, and the guilty parties are but rarely brought to justice. It was this state of affairs which led to the riot in New Orleans in 1890, when eleven Italian prisoners, incarcerated in the city jail upon suspicion of the murder of the chief of police, were taken from their cells and put to death by the mob. This act came near leading to the severance of diplomatic relations between Italy and the United States; but the difficulty was adjusted by the payment of a heavy indemnity to the families of the Italians that perished in the outbreak.

Magdale'na, the principal river of Colombia, South America, rises in Ecuador, about 2° north latitude, only eight miles from the source of the Cauca. These streams flow northward, one on each side of the central Cordillera range, uniting about 100 miles from the Caribbean sea, into which their waters are discharged. The Magdalena is navigable to Honda, 620 miles from its mouth, where the rapids begin; and above these it has been navigated to Neiva since 1875, a 20-mile railway alongside the rapids connecting the upper and lower portions of the stream. The length of the Magdalena is 1,050 miles, and the area of its drainage has been estimated at 92,000 square miles. Magdalena' is also a province or department of the republic of Colombia, and the seat of silver mines. It has an area of 24,440 square miles, with a population of 90,000; its capital is Santa Marta (population 6,000).

Magdeburg (*măg'de-bŏrg*), the capital of Prussian Saxony, and one of the chief fortresses of the German empire, is situated on the Elbe river, 90 miles from Berlin and 72 miles from Leipsic. Magdeburg was founded by Charlemagne in 805, and rebuilt by Editha, after its destruction by the Wends, in 924. During the Thirty Years' war it was besieged for twenty-eight weeks by Wallenstein in vain; but two years later (1631), it was taken by Tilly and burned to the ground, nearly the entire population perishing by fire or sword, or by drowning in the river. Magdeburg is at the junction of five railways, and its river trade is large. The city was taken by the French in 1806, but was restored to Prussia in 1814. It is the center of the German sugar trade, and has many manufactures, with a notable cathedral, which dates from the 12th century. Population (1900) 229,663.

Magellan (*ma-jĕl'lan*), **Ferdinand,** a Portuguese navigator, was born at Oporto about the year 1480. After several years' service in the Portuguese navy he visited Spain, and laid before Charles V. a scheme for reaching the Moluccas, or Spice islands, by sailing west, which was favorably received and acted upon by that emperor. Magellan sailed from San Lucas, Aug. 10, 1519, with five ships and about 250 men. Reaching the mouth of the La Plata river, and sailing along the coast of Patagonia, he passed through the strait that separates the island of Terra del Fuego from the mainland, and entered the vast ocean which he named the Pacific, on account of the smooth and tranquil waters that he found there. He continued his voyage across the Pacific until he reached the Philippine islands, which he at once proceeded to take possession of in the name of the Spanish king; but in an encounter with the natives of the island of Mactan, who resisted his authority and his efforts to convert them to Christianity, he was killed April 27, 1521. His only remaining ship, the *Victoria*, was brought back to Spain by Sebastian del Cano, who reached San Lucas Sept. 6, 1522; and thus was completed the first voyage ever made around the globe. See *Life*, by Towle.

Magellan, the name of the strait separating South America from the island of Terra del Fuego, and connecting the Atlantic and Pacific oceans. It is over 300 miles in length, its breadth varying from 10 to 15 miles. This strait was first discovered by Ferdinand Magellan, who sailed through it in the year 1520, and it has ever since borne his name.

Magenta (*mă-jĕn'tă*), an Italian town, 16 miles west of Milan by rail. Here on June 4, 1859, occurred the terrible battle between the French and Sardinians on one side and the Austrians on the other, in which the Austrians were defeated with a loss of 10,000 killed and wounded, besides 7,000 prisoners. For his part in winning this victory, Marshal McMahon was created by the emperor Louis Napoleon, duke of Magenta.

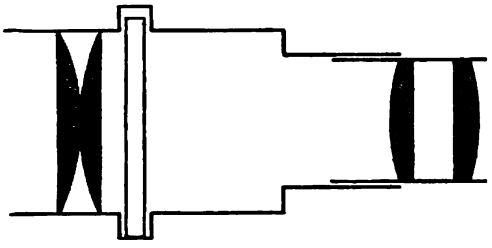
Maggiore (*măd-jō'rā*), **Lago,** one of the largest lakes in Italy, although the northern portion of it extends into the Swiss canton of Ticino. It is about 40 miles in length, and its breadth varies from one to five miles. It lies a little to the west of Lake Como, on the southern frontier of Switzerland. It is 600 feet above the level of the sea, its greatest depth being about 2,000 feet. On the north and west it is surrounded with granite mountains, and on the south and east, by vine-covered hills. It has some very picturesque scenery; on its banks are the Swiss towns Locarno, Intra, Pallanza, Luino, and Laveno.

Magi (*mā'jī*), the priestly caste among the ancient Persians. They were not only "keepers of the sacred things, the learned of the people, the philosophers and servants of God," but also diviners of the future, augurs, and astrologers. They were held in the highest reverence; and no transaction of importance took place without their counsel or advice. Zoroaster, in the course of his great religious reform, reorganized the Magi, sub-

jected them to the most rigid discipline, and prescribed a mode of life suitable to their sacred office. For a long time their influence was almost without limit, but it afterward declined until they became mere jugglers and fortune tellers, and gave their name (magic) to the tricks of conjurers and sorcerers.

Magic Lantern, an optical instrument mostly used by lecturers for projecting upon an opaque screen an enlarged and brilliant image of a picture or object otherwise too small to be seen simultaneously by an audience.

The ordinary magic lantern consists of five essential parts, as indicated in Fig. 1., namely:—



MAGIC LANTERN.

1. A source of light to illuminate the picture or object which is to be projected upon the screen.

2. A lens which collects the light from this source and trains it upon the picture or object. This is called the "condensing lens," or more briefly, the "condenser."

3. A "slide," that is, the picture or object which is to be shown to the audience.

4. A lens which will produce a good image of the illuminated slide. This is called the "projection lens."

5. A screen or wall—generally opaque and very white—upon which the projection lens casts the image which is to be viewed by the audience.

During the 17th and 18th centuries, this instrument was largely employed by magicians to produce certain curious effects for public entertainment. Hence the name "magic lantern," which is now largely replaced by the name *sciopticon*, or *stereopticon*.

The best source of light to employ is the electric arc; but when this is not available, the next best source is the "lime light." (See DRUMMOND LIGHT.) But the lime light requires a cylinder of coal gas and a cylinder of oxygen; and where these are not available an acetylene flame, or an oil lamp with two or three flames, makes a very fair substitute. Incandescent electric lamps of high candle power are now made for this special purpose.

The condensing lens is usually made up of two single plano-convex lenses with their spherical faces opposing each other. Since this lens is used only to throw light on the picture, and not to produce an image, it need be only a low-grade lens. Passing now to the "slide," it was the discovery of photography that led to the use of the lantern as a means of instruction rather than a means of amusement. The picture on the slide should be sharp so as to bear magnifying and clear so as to give a brilliant image.

The projection lens should be placed in a position between the slide and screen so that, when the slide is in one conjugate focus, the screen will lie in the other conjugate focus. It is necessary also that this lens should be of a rather high-grade—corrected both for chromatic and spherical aberration—since the definition of the image on the screen depends immediately upon this lens.

When the screen is viewed from the side on which the lantern is placed it should be as white and smooth as possible. And since it acts as a diffusing screen it is essential that no light should be lost by passing through the screen. It should, therefore, be filled with sizing or paint to make it opaque. See Wright's *Light* (Macmillan).

Magna Charta (*măg'nă kär'tă*), the great charter signed by King John of England, at Runnymede, June 15, 1215, which has ever since been regarded as the foundation of English liberty. Under the feudal system the tyranny and oppression of the Norman kings had become so great that, in the reign of King John, the English barons rose up against him and compelled him to sign this charter. By its provisions a great many abuses connected with the feudal system were abolished. Justice was no longer to be sold or denied to the subject. Life, liberty, and property were to be protected against the arbitrary will of the king, and no one was to forfeit either of these except by the law of the land. Fines imposed were to be in proportion to the offense, and even the humblest subject was not to be deprived of his lawful possessions. The great charter was renewed by John's successor, Henry III., in the ninth year of his reign and on five subsequent occasions before his death; and in the year 1300, it was finally confirmed by King Edward I. and his parliament.

Magne'sium, a widely distributed metallic element which is never found in the free state. It is present in many minerals, in carbonate of lime and magnesia, asbestos, meerschaum. It exists in mineral waters, and in the sea as a sulphate, and as chloride. A sulphate is Epsom salts, which Drew extracted from the Epsom spring in 1695. The metal was first discovered by Davy. For a long time its manufacture was on a small scale; but now it is made in large quantities. Chlorides of potassium and magnesium and fluor spar, with metallic sodium added, are fused together. The crude metal is finally distilled and pressed in a semi-fluid state into ribbon or wire. The metal is also prepared by passing an electric current through a fused

mixture of salts instead of using metallic sodium. It has a silver-white color, which is tarnished by moist air. It is very light, readily volatile, and when lighted burns in air with an intensely brilliant light rich in chemical rays. On this account it was much used in photography until the electric light took its place. The medicine calcined magnesia is the oxide of magnesium, the same substance as that formed when magnesium is burnt.

Mag'net, any mineral body that has the power of attracting iron or steel. A magnet may be natural or artificial, permanent or temporary. LOADSTONE is an iron ore that is very magnetic, and so forms natural magnets. The name comes from this property of drawing or leading bits of iron, "loadstone" meaning leading-stone. The first magnets used were pieces of this loadstone, which is a black mineral found very commonly in volcanic rocks and in beds with other iron ores. Large quantities are found in Sweden, and in the United States it is found in New York and New Jersey, and also in Asia Minor, near the town of Magnesium, from which magnets were named. Artificial magnets were first prepared by rubbing a bar of iron or steel with a magnet made from the loadstone. They are now made also by passing an electric current through a bar of iron or steel, or through a wire. The steel becomes a permanent magnet; the iron is only temporary, losing its power after the current ceases. Magnets can be made strong enough to hold up two tons, or two common loads of coal. A magnet's power of attraction is strongest at the ends, so that they are usually made in the shape of a horseshoe, which brings the two ends together. These ends are called the poles of the magnet, and while both poles will attract metals equally, they will act differently on other magnets. The north end or pole of a magnet will attract the south pole of another magnet, but will drive away the north pole, so that like poles repel each other and unlike poles attract. The poles are named north and south poles, because when a magnet is left free to move it will turn the same end always to the north and the other end to the south, as is seen in the mariner's compass. This is supposed to be due to the fact of the earth itself being a great magnet. This polarity, as it is called, is always found in magnets, and if you cut one in two there will be a north and south pole in each division. Steel magnets are made more powerful by placing several magnets together with their poles in the same direction. The magnet will not lose its magnetism by giving it to another piece of iron or steel, but it does lose it gradually if left alone. To avoid this, a piece of soft iron is placed across the two ends of the magnet, with a hook to which a weight can be attached. This piece of iron, called an armature, is thus turned into a magnet and receives the magnetism. By increasing the weight every few days, the magnet will grow stronger. Iron and steel are the substances most easily attracted by the magnet, but cobalt and nickel and some liquids and gases are also attracted by it. What magnetism is, is still undetermined; but it seems to be something in the atoms or particles of the magnetic body. The accepted theory is that it consists of two magnetic fluids in the body of the magnet adhering to the atoms, and that in a body not magnetized these two fluids counteract each other. Magnets made by electricity are called electro-magnets, and are used in the telephone, dynamo, etc. See ELECTRICITY, DYNAMO, TELEPHONE.

Mag'netism. It has been known for many centuries that a certain kind of iron ore, which mineralogists call *loadstone* or *magnetite*, has the remarkable property of attracting iron filings. A body which possesses this property is said to be *magnetized*, and is called a *magnet*. Certain parts of a magnetized body attract iron filings more strongly than others. These parts are called *magnetic poles*. A piece of iron can be magnetized by rubbing it over a piece of lodestone; and if the iron have a long, slender shape it will ordinarily have only *two* poles. The first important discovery in magnetism was made some time near the 12th century of the Christian era, when it was found that if a piece of magnetized iron be freely suspended it always sets itself so that a certain direction in it makes a fixed angle with the geographical meridian, *i. e.*, with the north-and-south line. This, of course, is the fundamental principle of the ordinary mariner's compass.

The direction in which the freely suspended compass needle points, at any place, is called the *magnetic meridian* at that place. The angle between the magnetic and geographical meridians is called the *magnetic declination.*

Before the time of Columbus first voyage to America, it was thought that the magnetic declination was a constant quantity. But on the voyage mentioned Columbus found that the declination varies from one point to another on the earth's surface. This was a discovery of the utmost importance to navigators. It might be called the second important discovery in magnetism.

Hartmann, who lived at a time intermediate between Columbus and Galileo, found that if a needle be suspended so as to lie *horizontal* before magnetization, it does not remain horizontal after magnetization; on the contrary, the north end "dips" down as if it had become heavier than the south end. This phenomenon is known as *magnetic dip;* and its discovery may be called the *third* important one in magnetism.

The first profound student of magnetism was Dr. William Gilbert (*b.* 1540; *d.* 1603), who was the leading man of science in England during the reign of Queen Elizabeth. He was led to conclude from the manner in

which small magnets behave at various points on the earth's surface that the earth itself is a gigantic magnet. But how the earth became magnetized is a problem which no one has yet been able to explain.

Gilbert showed also that when an iron magnet is heated to red heat, it not only ceases to be magnetized, but loses all ability to become magnetized. Red-hot iron behaves, therefore, not as cold unmagnetized iron, but as cold brass or glass or zinc. This discovery is described by saying that iron loses magnetic quality at red heat.

Gilbert also made it highly probable, by his experiments on broken magnets and on heated magnets, that magnetism is a molecular phenomenon, a prime discovery which all subsequent experiments have confirmed.

If, to the phenomena already described, we add that of *magnetic induction*, we shall have a fairly complete summary of the fundamental facts of magnetism. A piece of unmagnetized iron when brought near a magnet immediately acquires magnetic poles, *i. e.*, it exhibits magnetization as well as magnetic quality. A wire nail held near a strong magnet is not only attracted itself, but will also attract other iron nails or iron filings. These wire nails are said to be magnetized by *induction*. The most useful and most interesting case of induction met with in modern science is that of the *electro magnet*. Here an electric current is made to flow through a coil of wire in which is placed an iron core. This combination is called an *electro magnet*, and is a fundamental part of the dynamo, motor, telephone, and telegraph instrument.

Faraday made one of the great advances of modern times when he introduced into the study of magnetism the method of "lines of force," and the idea of the "magnetic field." For these and other more advanced considerations, see Ewing's *Magnetization of Iron and other Metals*, which is undoubtedly the best treatise on the subject in the English language. HENRY CREW.

Magno'lia, a genus of highly ornamental trees or shrubs, containing about 20 species, which are native to North America and eastern Asia. The finest of the American species, and the one most largely cultivated in the south, is *M. grandiflora*, which is native from South Carolina to Louisiana. In its wild state it reaches a height of 100 feet, and has very large thick leaves, the flowers being frequently a foot in diameter when flatly expanded. The other native magnolia in common cultivation is *M. glauca*, or "sweet bay," which reaches a height of about 30 feet.

Mag'pie, a bird of the crow family closely related to the jays, but distinguished by having a much longer and graduated tail. The true magpies are mostly inhabitants of the Old World. The American form is a variety of the European species, and occurs in the northwest from the Pacific coast east to Wisconsin. It is about sixteen or eighteen inches long, of black iridescent color, with white on

MAGPIE.

the under surface and wings. It is easily tamed and can be taught to articulate a few words. Its note is harsh, and it keeps up a continual chattering when disturbed. The food of the magpie is mainly snails, worms, frogs, rats, etc. Its nest is protected by rough thorns. These birds are noted for thievishness; they have a propensity to carry away and conceal bright articles, and, therefore, often steal jewelry. A great amount of popular superstition attaches to them. They were long regarded by superstitious people as birds of evil omen associated with witchcraft and the black art.

Magruder (*ma-grū'der*), **John B.,** an American soldier, was born Aug. 15, 1810, at Winchester, Va. At his graduation from West Point in 1830 he received an appointment as second-lieutenant in the infantry, becoming first-lieutenant six years later, and a captain at the outbreak of the Mexican war. He served throughout the invasion of Mexico under General Pillow, as the commanding officer of a battery. He was twice brevetted for bravery at Cerro Gordo, and again after the battle of Chapultepec, when he became lieutenant-colonel. He remained in the regular army until the breaking out of the Civil war, when he resigned in order to enter the Confederate force, in which he became a major-general. He took part in the battle of Malvern Hill, the fight on the Chickahominy, etc., but was afterward transferred to the southwest, being actively engaged in Texas at the time of the surrender of General Lee. He retired to Mexico where he accepted a commission as major-general in the army of Maximillian. Upon the collapse of the attempted empire he returned to Texas, lecturing in various southern cities. He died at Houston, Tex., Feb. 19, 1871.

Mag'yars. See HUNGARY.

Mahaffy (*mȧ-hăf'fi*), **John Pentland,** an Irish classical scholar and writer, was born in Switzerland, Feb. 26, 1839. He studied at

Dublin and in Germany, and became successively tutor, lecturer, and professor of ancient history in Dublin university. His works are mostly on subjects connected with his teaching, among them *Lectures on Primitive Civilization*, *Greek Social Life*, *Rambles and Studies in Greece*, *History of Classical Greek Literature*, *The Story of Alexander's Empire*, and *Greek Life and Thought*. He has edited Duruy's *Roman History*, and also translated Kuno Fischer's *Commentary on Kant*, and published Kant's *Critical Philosophy for English Readers*. Among his other publications are *The Decay of Modern Preaching*, *The Art of Conversation*, and the *Life and Teaching of Descartes*.

Mahan (*ma-hän'*), **Alfred Thayer,** a naval officer, was born Sept. 27, 1840, at West Point, where his father was a distinguished instructor in military engineering. He graduated from the United States Naval academy in 1859 and served throughout the Civil war, chiefly in the South Atlantic and Gulf squadrons. He was head of the department of gunnery in the Naval academy from 1877 to 1880, and president of the United States Naval War college, Newport, R. I., 1886–89. After various distinguished services rendered the republic in connection with naval commissions and educational institutions, he was appointed to the command of the United States cruiser, *Chicago*, and attached to the European squadron May 11, 1893. He soon became widely known for important works upon the history and philosophy of naval warfare and was exceedingly popular abroad, Cambridge conferring upon him the honorary degree of LL.D., and Oxford that of D.C.L. His writings embrace *The Gulf and Inland Waters*, *The Navy in the Civil War*, *The Influence of Sea Power upon History*, *The Life of Admiral Farragut*, *The Interest of the United States in Sea Power* and various other works, including a *Life of Lord Nelson*. Captain Mahan retired from active service in 1896, but was made a member of the Naval Advisory Board during the war with Spain, 1898, and appointed by the President one of the delegates to the peace conference at The Hague, 1899.

CAPTAIN A. T. MAHAN.

Mahanoy (*mä-ha-noi'*) **City, Pa.,** a borough in Schuylkill county, in the anthracite coal region, on the Lehigh Valley and on the Philadelphia and Reading railroads, 55 miles northeast of Harrisburg and 80 miles northwest of Philadelphia. It was founded in 1859, and has since developed greatly, due, in great measure, to the famous mines in its vicinity. There are in the immediate vicinity of the town about 20 collieries, giving employment to a large number of miners. Besides these mines, there are a number of iron foundries, potteries, etc. Population 13,504.

Mahdi (*mä'dē*), the Mohammedan restorer of all things. He is not mentioned in the Koran, but is said to have been promised by Mohammed to complete his work — to fill the world with righteousness. The Mahdi is a Mohammedan messiah. In Mohammedan history, at different times men of ambition have arisen who have set up claims to being the Mahdi. Hence the claim figures in war and strife between rival tribes and nations. In 1799, a Mahdi arose in Egypt against the French. Political exigencies have led men to set forth the claim. In 1883, one assumed the title of Mahdi and led a revolt against the khedive of Egypt. He seized El-Obeyd, the chief city of Kordofan, and made it his capital; and on the 5th of November the Egyptian army of Hicks Pasha was annihilated. In 1885, Khartum was taken, and General Gordon, whom England sent to pacify the Sudan, was killed. This Mahdi died at *Omdurman* on the 25th of June, 1885.

Mahog'any, the wood of *Swietenia mahogani*, which belongs to the family *Meliaceæ*. The tree becomes 70 feet high, and is native to Central America and the Antilles. Its beautiful dark red wood is chiefly used in veneering. The species of *Cercocarpus*, a genus of the rose family, is also popularly called mountain mahogany. There are four known species, which are found in the Rocky mountains from Montana to Mexico. The name is suggested by the very heavy and cross-grained wood.

Mahom'et. See MOHAMMED.

Mahone (*ma-hōn'*), **William,** a Confederate soldier and Federal senator, was born in Southampton county, Va., Dec. 1, 1826. His paternal ancestors were Irish, but long resident in America, and both his grandfathers served in the War of 1812. At the outbreak of the Civil war he entered the Confederate army, taking part in the capture of the Norfolk navy yard, April 21, 1861. Having been both student and instructor in military schools, he was rapidly advanced in the service

GEN. WILLIAM MAHONE.

and soon became colonel of the 6th Virginia infantry. He was engaged in all the desperate fighting about Petersburg toward the close of the war, and was called "the hero of the crater" on account of his bravery at the time General Grant exploded the mine under the earthwork popularly known by the Federal soldiers as "Fort Hell." This was July 30, 1864. He rose to the rank of major-general in the Confederate army. At the close of the war he returned to railway management in which he had been previously engaged and became president of the Norfolk and Tennessee road. He was elected to the United States senate in 1880, where, while nominally an independent, he usually voted with the Republicans. He retired from public life in 1889 and made his home at Petersburg, Va., where he died Oct. 8, 1895.

Mahrattas (*mȧ-rȧt'tȧz*), a people of mixed origin, who formed a famed and historic confederacy, Hindus in religion and caste laws, inhabiting western and central India. Our first knowledge of them in history is in the 17th century, when they possessed a narrow strip of territory on the west side of the peninsula. Their founder was a freebooter, Sivaji. He compelled several independent Hindoo chiefs to acknowledge him as their leader and with them overran and subdued a large portion of the territory of the emperor of Delhi. Under the fourth sovereign's reign there were five Mahratta states. The Delhi empire being invaded by Nadir Shah, the Mahrattas embraced the opportunity to snatch some more territory from the Mogul emperor. From this time they seemed to have discharged the office of arbiters between the emperor, his vizier, and his rebellious subjects. In 1761, they suffered a frightful defeat at the hands of the ruler of Afghanistan. They lost 50,000 men in this conflict. The growing influence of the British in India compelled them to give up serving as hired mercenaries in others' disputes, and to look out for their own safety. After many long and bloody contests with the British and their allies (1780, 1803, 1817–18), with the exception of Sindia, they were reduced to a state of dependence. Sindia officered his troops with Frenchmen, disciplined them after European methods and carried on the struggle with the British, till his power was broken in 1843. The son of the last reigning rajah, who became a British prisoner in the neighborhood of Cawnpore, was the infamous Nana Sahib, whose connection with the meeting in 1857 is historic. See INDIA.

Maimonides (*mi-mon'e-dēz*), **Moses**, a Jewish theologian, philosopher, and teacher, was born at Cordova, Spain, in 1135; and died at Cairo, Egypt, in 1204. His influence upon Judaism has been so important, that not without reason has he been classed as second to Moses himself. He brought into system multitudes of discussions, traditions, and decisions. He wrote an Arabic commentary on the Mishnah, and an historical introduction to *Tradition*. This introduction, translated into Hebrew, has now for more than 500 years been deemed so essential a part of the Talmud itself that no edition of the latter is considered complete without it. His greatest work, *Dalalt Al-Hairin* (Guide of the Perplexed), in Arabic, has been republished in three volumes by Friedlander in 1886.

Main, a river of Germany, the largest affluent the Rhine receives from the right. It mingles its yellow waters with the green current of the Rhine opposite Mainz (Mayence), after a zigzag course of 307 miles, the last 205 of which are navigable. It flows through a beautiful country. The hill slopes are generally covered with vineyards, and surmounted with castles. Its waters are joined to the Danube by a canal. The Main divides North Germany from South Germany. Frankfort is one of the chief cities on its banks.

Maine, the most eastern state of the Union, belonging to the New England group, admitted to the Union March 15, 1820. It has a long coast line on the Atlantic of 218 miles in a straight line, but is so indented by bays and islands that its shore measures 2,486 miles. On the east and north it touches New Brunswick, and on the west the province of Quebec. It is 303 miles long and 212 miles wide, and covers a land surface of 29,895 square miles, being one-half as large as New England. There are several ranges of mountains and some large peaks, as Mount Katahdin, 5,385 feet high; Mount Baker, 3,589 feet, and Saddleback mountain, 4,000 feet. The state has, besides its land surface, 1,568 lakes and ponds, Moosehead lake being the largest. The Penobscot, 270 miles long; the Kennebec, 155 miles, the Androscoggin and Saco are the principal rivers. The coast is a succession of islands and peninsulas and deep bays, forming what Whittier called "hundred-harbored Maine." The largest island is Mount Desert, covering 100 square miles, with thirteen mountains rising from the sea. This and other places on the coast and further inland are very popular summer resorts. The forests of Maine cover 20,000 square miles, and are seven times greater than the Black Forest of Germany. The fine trees of pine, elm, oak, and maple, etc., supply the great lumber trade of the state. The wild animals, such as deer, moose, caribou, wolverines, and bears, sables, minks, foxes, still found in the forests, give employment to hunters, and their skins furnish a large article of trade. Fishing is another industry, mackerel, lobsters, and herrings being collected in large numbers, and the waters of the rivers and lakes furnish ice in large quantities for shipment. Maine is rich in minerals; iron, lead, tin, copper, and zinc are found, and gold and silver in small quantities. Granite, felspar, mica, slate, and tourmaline are also found.

The granite quarries are very extensive, and lime is made on a large scale. There are also several good slate quarries. Much of the land of Maine has not yet been used for agriculture, but the Aroostook valley is the most fertile part of New England. Fruits are abundant, and the canning of fruits and vegetables is a large industry. The manufactures are boots and shoes, paper, leather, and flour. Its chief industries are cotton and woolen factories, pulp and paper, planing, shingle, and stave mills, canning and sardine-packing factories, with creameries, cheese, and starch factories. The state has a total railway mileage of 1,923 miles.

The State College of Agriculture and Mechanic Arts (University of Maine), at Orono, on the Penobscot, founded in 1868; Bowdoin college at Brunswick, opened in 1802, with a state endowment; Colby university at Waterville, Bates college at Lewiston, Bangor Theological seminary, Westbrook seminary at Deering, and Maine Wesleyan seminary and Female college at Kents Hill, are among the institutions of learning. Maine is thought to have been visited by the Norsemen in 900 and by Sebastian Cabot in 1497. The French made the first settlement in 1604, and Capt. John Smith, in 1616, took possession of Monhegan island. An English colony was formed on the Piscataqua river in 1623, and in 1639 Charles I. gave Sir Ferdinand Gorges a charter of the region between the Piscataqua and the Kennebec, under the title of the "province of Maine." Massachusetts claimed the region under her charter, and in 1677 bought out the interest of the Gorges, making it a part of Massachusetts until 1820, when Maine was admitted into the Union. There was a long dispute with Great Britain over the boundary line between Maine and the British possessions, which was finally settled in 1842. Maine has suffered in the past from emigration to the west, but its population is increasing by the immigration of foreigners, particularly the French Canadians and the Swedes. Population 694,466. See G. J. Varney's *Brief History of Maine.*

Maine, Sir Henry James Sumner, a celebrated lawyer of England, born Aug. 15, 1822, and died at Cannes, France, Feb. 3, 1888, of apoplexy. At the age of 25 he was appointed professor of civil law. In 1862, he went to India as law member of the council in India, an office held by Lord Macaulay. In 1877, he was elected Whewell professor of international law at Cambridge. Maine introduced wise reforms into Indian law, but his work on the origin and growth of legal and social institutions is the work on which his fame mostly rests. His publications include *Ancient Law, Village Communities, Early History of Institutions, Popular Government, International Law,* and *Dissertations on Early Law and Custom.*

Maintenon (*măn-te-nôn'*), **Francaise D'Aubigne,** Marquise de, was born in prison at Niort, France, Nov. 27, 1635. She was brought up in the West Indies, but returned to France in 1645. When she found herself at fifteen reduced to poverty by the death of her parents, the poet Scarron offered either to marry her or pay her entrance fee to a convent. He was lame and deformed, but she chose to marry him, and for nine years was the center of the intellectual society of his house. At his death his pension was continued to her, and in 1669 she was appointed governess of two of the sons of Louis XIV. At the death of the queen she was privately married to Louis XIV. Her influence over him was very great, and on the side of morality, and she was a liberal patroness of literature and art. She founded at St. Cyr a home for poor girls of good family, in memory of her own youth, and retired to it on the death of the king in 1715. She died at St. Cyr, near Versailles, April 15, 1719. See *Life*, by Bowles.

Maize. See CORN.

Majolica (*ma-jŏl'ĭ-kă*), a decorated kind of enameled pottery made in Italy from the 15th to the 18th century. It is an earthenware, usually of a coarse paste covered with a stanniferous (*i. e.*, affording tin) glaze or enamel. Sometimes it is called "Raffaelle ware," from the fact that a number of the paintings on it were copied from the designs of that famous painter. Majolica is generally considered the most beautiful decorated pottery that was ever extensively made, at least during the Christian era. It seems to have been first made on the island of Majorca, of which Majolica is the Italian name.

Majorca (*ma-jôr'kă*), the largest of the Balearic Isles; area, 1,310 square miles. In the north there are mountains from 3,500 to 5,000 feet in height. Olive groves abound everywhere, and almond, orange, fig, and other fruit trees are common. A London company, in 1871, drained 5,000 acres of marsh lands, which are of extraordinary fertility. Majolica is still made here to a small extent. Majorca, with Minorca and Ivica, all lying in the Mediterranean, off the coast of Valencia, form a province of Spain, called Baleáres (or in English the Balearic Isles); total area 1,860 square miles; population 306,926. The chief town of Majorca is Palma, on the southwest coast (population 62,525).

Malacca (*ma-lăk'ă*) or **Malay Peninsula,** is the long strip of land extending from Indo-China southward toward the island of Sumatra. The peninsula begins at the head of the gulf of Siam, and includes parts of Siam and Burma, covering 75,000 square miles. There are mountain ranges, covered with forests, running the entire length of the peninsula, with peaks from 6,000 to 8,000 feet in height. The camphor, ebony, teak, sandalwood, cinnamon, rattan, cocoa, and nutmeg

are the more valuable trees. It is the largest tin-yielding region in the world, and gold, silver, iron, and coal are found, though the mines are not much developed. The crops are rice, sugar cane, cotton, tobacco, yams, and cocoanuts. Population 1,200,000. Malacca is the name also of the British settlement in the southwestern part of the peninsula, and of the city which is its capital. In 1867, Malacca, with Penang, and the island of Singapore, were transferred from the Indian government of Britain to the control of the British secretary of state for the colonies, under the designation of the Straits Settlement, and erected into a crown colony. The seat of government is the town of Singapore. Christmas island and the Cocos islands have since been attached to the Straits Settlements.

Malacca, Strait of, a waterway or sea passage which separates the Malay peninsula from the island of Sumatra, and forms the channel between the Indian ocean and the Chinese sea. It is 480 miles in length, and from 30 miles to 200 miles broad.

Malaga (*mȧl'a-gȧ*), a seaport in the south of Spain, on the Mediterranean. It has a wonderfully equable and uniform climate, of which dryness and constant sunshine are the characteristics. It is one of the most important seaports of Spain, yet its trade has been declining since 1878. Diseases have ravaged the vines, the orange, and lemon groves. The United States, its great customer for Malaga raisins, now uses California raisins. Population 125,579. The town was founded by the Phœnicians; hence is very old. A Moorish castle is one of its few noted buildings. Ferdinand and Isabella captured it from the Moors in 1487.

Malay' Peninsula. See MALACCA.

Malays (*ma-lȧz'*), the race found in the Eastern archipelago and the neighboring peninsula, which are named from the Malay archipelago and the Malay peninsula. They belong to the Mongols, and are usually short in stature, being not much over five feet in height, with yellow skin, straight black hair, almond-shaped eyes, and flat features, resembling very much the Chinese. But their language is entirely different from that of the Asiatic Mongols; belonging to the great Polynesian family, which extends across the Indian and Pacific oceans. Since the 13th century the Malays have been the traders of the archipelago, and of late years have given up their roving habits, and are occupied with trade and agriculture. Their language is simple in structure, and soft and harmonious. It is written in the Arabic character, though lately the Roman system has been adopted. See *The Malay Archipelago*, by Wallace.

Malbone', Edward G., an American portrait painter, was born at Newport, R. I., in August, 1777. He began as a portrait painter when only seventeen, settling in Providence, R. I. He followed his profession afterward in Boston and Charleston, and in 1801, went to Europe with Washington Allston. *The Hours*, three female figures representing the Present, Past, and Future, is considered one of his best works. He died May 7, 1807, at Savannah, Ga., where he had gone in search of health.

Malcolm (*mȧl'kom*), **Sir John,** a British soldier, statesman, and historian, was born in Dumfriesshire, Scotland, May 2, 1769, and died May 30, 1833. At fourteen years of age he went to India as a cadet in the Madras army. In 1800, he was sent to Persia as an ambassador to form an alliance against Bonaparte. In 1803, he was appointed governor of a department in India. For years he occupied responsible situations for the British in India. The duke of Wellington wrote him in 1824, thus: "From the year 1796 no great transaction has taken place in the east, in which you have not played a principal, most useful, conspicuous, and honorable part." He wrote *A History of Persia*, *Memoir of Central India*, *Political History of India from 1784 to 1823*.

Malden (*möl'den*), **Mass.,** a busy and thriving manufacturing city, incorporated in 1882, on the Malden river, and the Boston and Maine railroad. It lies four miles north of Boston, and is the seat of many large industrial interests, chief of which are the Boston Rubber Shoe company, establishments for the manufacture of carpets and rugs, cotton goods, leather goods, boots and shoes, and shoe lasts, sand and emery paper, cord, etc. It has many substantial public buildings, libraries, schools, churches, banks, and other edifices. It does much for education in the extent and character of its public schools. Population 33,664.

Maldive (*mȧl'dīv*) **Islands, The,** lie off the coast of Malabar extending southward about 20 degrees of latitude, reaching an extreme length of 500 miles with an average breadth of 45 miles. The islands are composed of coral, and may be divided into 17 groups, each group or atoll being surrounded by a coral reef. It is estimated that there are 12,000 islands in the chain, of which 600 are charted and 200 inhabited. At no point does the surface of the land rise more than six feet above the sea, and the greater part of the surface exposed at low tide is covered when the tide returns. The population is estimated at from 20,000 to 30,000. The native races exhibit characteristic features of the Malays, the Singhalese, and Africans, and they are evidently a mixed race. The Portuguese, French, and Dutch, have at various times asserted authority over these islands; but they now constitute a dependency of Ceylon. The exports of tropical fruits are considerable; grain is also grown, and immense numbers of wild fowl frequent the archipelago. The

inhabitants live chiefly upon fish, rice, and cocoanuts. The people are at least nominally Mohammedans.

Male cell (in plants), the general name of the sperm or male gamete, which may take a variety of forms. The special use of the phrase, however, is in connection with the angiosperms, in which the cell which fertilizes the egg is unlike ordinary sperms in several particulars, and is usually called simply the "male cell" rather than "sperm."

Malibran (*mă-lē-brŏn'*), **Maria Felicita,** a famous operatic singer, was born at Paris, March 24, 1808. She made her début in London in 1825. Soon her reputation extended over Europe. At New York, she married M. Malibran, a French merchant, who became bankrupt. She returned to the stage, and was received with great enthusiasm in Italy, France, Germany, and England. Her marriage with Malibran being dissolved, she married M. Beriot, a famous violinist, in 1836, but on the 23d of September of the same year she died, at Manchester, England.

Mal'lard, a common wild duck inhabiting the northern hemisphere. It belongs to the group of river ducks, and is abundant in both the Old and New Worlds. The head and neck of the male are bright green and, therefore, it is commonly called the green-head. It is the original from which most of the domestic ducks are descended. In the western United States it visits cornfields, and in the southern Atlantic states, the ricefields. It is extensively hunted by the use of decoys, and its fine-flavored flesh makes it a favorite for the table.

Mal'lock, William Hurrell, an English writer upon religious and sociological themes, was born in Devonshire, England, in 1849. His mother was a sister to J. Anthony Froude, the historian. He graduated from Oxford, Balliol college, with honors. While still an undergraduate, he won the Newdegate prize by his poem entitled, *The Isthmus of Suez;* and his anonymous little poem, put out about the same time (1871), called *Every Man his own Poet*, attracted much attention. He wrote a large part of his *The New Republic* while still at the university, publishing it in completed form soon after his graduation, in 1876. His residence since has been changed from Oxford to London; again to the south of France and then back to Oxford. He has continued to publish works upon his favorite studies, among which are, *Is Life Worth Living? The New Paul and Virginia; Studies of Contemporary Superstitions; Social Equality; Property and Progress*, a reply to Henry George; *Labor and the Popular Welfare; The Old Order Changes; Classes and Masses, or Wealth, Wages and Welfare in the United Kingdom*, besides many others. His first purpose in nearly all his writings has been to expose the fallacies of socialism, and his secondary purpose to show that science cannot supply a basis for religion such as will suffice for the needs of man.

Mal'lory, Stephen Russell, a senator of the United States, 1851–61, was born in Trinidad, West Indies, in 1813, the son of a Connecticut shipmaster. He settled in Florida with his parents in 1820; was admitted to the bar in 1833 at Key West; was inspector of customs under Jackson; United States senator from 1851 to 1861; and at the outbreak of the Civil war entered the Confederacy, becoming secretary of the Confederate navy. After the war closed he was imprisoned; released on parole, and finally pardoned by President Johnson in 1867. He died at Pensacola, Fla., Nov. 9, 1873.

Mal'ory, Sir Thomas. Malory's work, a series of prose romances on the life and death of King Arthur and the knights of the Round Table, is immortal, though little of the author is known. The work is named *Morte D'Arthur*. Scott says, "It is indisputably the best prose romance the English language can boast of." He aimed to give epic unity and harmony to the whole mass of French romance. Caxton's edition of the work was finished in 1485. In the preface to this edition, we learn that Malory was a knight, and that he finished the work in 1470.

Malplaquet (*măl'plă'kā'*), a village in France, near the Belgian frontier, celebrated as the scene of the bloody defeat of the French under Marshal Villars, by the British and Dutch under the Duke of Marlborough and Prince Eugene, Sept. 11, 1709. The allied armies numbered over 1,000,000 men, and the French army somewhat less. The loss on each side amounted to about 20,000 men.

Malta (*mawl'ta*), an island in the Mediterranean, 58 miles south of Sicily. It is 17½ miles long and about 8 broad, and covers 95 square miles. It belongs to Great Britain, and is strongly fortified. It is the headquarters of the British Mediterranean fleet, and the chief coaling station for British vessels. There are several smaller islands (Gozo, Comino, etc.,) connected with it, belonging to England. Malta is treeless, and has no rivers or lakes, water being obtained from springs; but the soil is very fertile. There are several good harbors, and numerous odd caverns hollowed out by the sea, some of them quite large. The trade of the island is mainly one of transit; some 3,500 vessels enter and clear from the port annually, one-half of which are British. Wheat, potatoes, corn, barley, cotton, and the southern fruits are the principal products. Those of the people who are not engaged in agriculture are employed about the docks and harbors. The Maltese are a sober, industrious folk, fond of their home, called by them the "flower of the world." Their language is a dialect of Arabic, with a mixture of Italian, though the higher classes

speak English and Italian. The island is overcrowded with a population of 1,471 to the square mile, and large numbers of the people are obliged to emigrate, and are found in all parts of North Africa. There is a university, founded in 1769, with four faculties, and 120 public schools, with 15,669 in attendance. The cathedral of St. Paul, built in 1697, and the grotto of St. Paul, where the apostle is thought to have lived during his three months' stay on the island, as well as the bay of St. Paul, commemorate the apostle's shipwreck on his journey to Rome. The church of Musta, modeled after the Pantheon at Rome, has one of the largest domes in Europe. The capital of Malta is Valetta (pop. 50,000).

Malta was settled by the Phœnicians about 1000 B. C. The Greeks took possession about 700 B. C., the Carthaginians in 480 B.C., and the Romans in 216 B. C. Under the Romans it was famous for its cotton cloth, honey, and roses. Malta went with the eastern empire when the Roman kingdom was divided. In the 5th century, it was conquered by Vandals, and then by Goths, and in 870 the Arabs came into possession, but were driven out in 1090, by Count Roger of Sicily. Finally coming into the power of Charles V., he gave it to the Knights of St. John, who fortified it, making it very powerful. In 1798, the Knights surrendered the island to the French; but the people rebelled and succeeded after a two years' siege in driving off the French with the aid of the English. The people preferred the rule of Great Britain to that of the Knights, and the congress of Vienna in 1814 recognized Malta as a British dependency. Population 181,648. See *Malta, Past and Present*, by Seddall; and *The Story of Malta*, by M. M. Ballou (Boston 1893).

Mal'ta, Knights of, were a military and religious order of the middle ages. They were called also the Knights of St. John and Knights of Rhodes, and belonged to what were known as Hospitalers in the Catholic church, who were devoted to the care of the poor and the sick. The order was founded, about 1048, in a hospital built at Jerusalem and dedicated to St. John the Baptist. The order gradually became a military one, sworn to guard the holy sepulchre, and to war against unbelievers. Their last stronghold in Palestine was at Acre, which they yielded after a terrible siege by the ruler of Egypt and sailed to Cyprus in 1291. In the 12th century, the order was divided into eight divisions, called languages. After the capture of Rhodes and some neighboring islands by the Knights in 1310, they carried on from it a successful war with the Turks for more than two hundred years. Sultan Solyman took Rhodes from them in 1523, and they retired to Crete. In 1530, they received Malta as a gift from Charles V., which they yielded to the French in 1798. After the Reformation they declined in importance, and most of their lands were confiscated by the different European states. There are two or three branches of the order still existing, and two modern associations, one of which, the English Knights of St. John, was the principal founder of the Red Cross society. The badge of the Knights of Malta was an eight-pointed cross of white, edged with gold, called the Maltese cross, and their motto was "Pro fide" (for the faith), and later was added "Pro utilitate hominum" (for the good of man).

Mal'thus, Rev. Thomas Robert, an English clergyman and writer on political economy, was born at Albury, County of Surrey, England, in 1766. He entered Jesus college, Cambridge, in 1784, and graduated with high honors four years later. In 1797, he received a fellowship at Cambridge. He became rector of a small parish in Surrey, soon after receiving holy orders, and he divided his time between his ecclesiastical duties and his philosophic studies. It was in 1798 that he issued the work which made his reputation and by which he has since been known, an *Essay upon the Principles of Population as It Affects the Future Improvement of Society*. The leading idea of this work is that the population of the earth increasing steadily in geometrical ratio, the world must soon be over-populated; and that unless means to check such increase be promptly adopted, the nations of the earth must soon be brought to the verge of starvation. Neither war, pestilence, nor famine has as yet sufficed, he thought, to avert the sure catastrophe awaiting the race. He insisted that abstinence from marriage could alone keep down the threatened overplus of population. He himself married in 1805, and was the same year appointed professor of history and political economy in the East India college at Haileybury. Malthus also published *Observations on the Effects of the Corn Laws*, *Principles of Political Economy*, and *Definitions in Political Economy*. He died at Bath, Dec. 23, 1834.

Mal'vern Hill, Battle of, the last of the battles of McClellan's memorable Peninsular campaign. The hill is situated near the James river, Virginia, southeast of Richmond. After the battle of Gaines' Mill, June 26, 1862, when the Federals were driven back with heavy loss, McClellan began a retreat to the James river. His left wing, which was south of the Chickahominy, led the way through White Oak swamp. His right wing, which was north of the Chickahominy, was with difficulty withdrawn across that stream, and following through White Oak swamp was attacked by Lee at Savage Station and again at Frazier's Farm, where desperate battles were fought June 29 and 30. Then General McClellan reached Malvern Hill, on the north bank of the James river, where he secured a strong position. Massing his artillery he repelled

the attack of the Confederates July 1, with great slaughter. Again and again their columns were hurled forward only to be mown down by the Federal guns. The next day McClellan withdrew to Harrison's Landing, and the "seven days' fight" was at an end. McClellan's losses, including killed, wounded, and missing, were 15,849; Lee's were 19,749. But McClellan had lost the campaign, the attempt to capture Richmond had failed.

Mamelukes (*mam'e-lūks*), the Arabic word for white slaves, and especially the name of the slave kings of Egypt. They came from a body of Turkish slaves, brought in the 13th century from Asia Minor and the Caucasus, to act as the mounted bodyguard of the sultan of Egypt. On the death of their master they chose one of their own number his successor in 1250, and from that year to 1517 the Mamelukes ruled Egypt and Syria. There were forty-eight Mameluke sultans, often keeping the throne but a few years or months, in two royal houses, the Turkish and Circassian Mamelukes. Each sultan owed his throne to his courage and ability, and to his having the strongest battalions back of him. Each great lord was a little sultan on his own estate, with his bodyguard, ready on the first chance to fight his way to the throne. Violent and treacherous deaths were common, yet Egypt, since the Pharaohs, did not possess a more enlightened set of rulers than the Mamelukes. Their laws and police, their army, their naval enterprise, their postal service, their irrigation and engineering works, were all far ahead of their time. Most of the beautiful mosques of Cairo are of their building. Their brass work, wood carvings, ivory reliefs, tiles, mosaic pavements, and silk embroideries are all remarkable. Their dress, homes, and court were gorgeous. Turks as a rule, they had tastes beyond the right of the Ottoman Turk who conquered Egypt in 1517. The Ottoman pasha, who now ruled, allowed twenty-four beys to rule the provinces. These beys, all Mamelukes, soon got all the power, and the pasha became a cipher. Their last brilliant achievement was their desperate charge on Napoleon's squares at the battle of the Pyramids in 1798. Soon after Mehemet Ali came to power, and, by two treacherous massacres in 1805 and 1811, blotted out the Mameluke princes, except a few who fled to the Sudan. See S. Lane-Poole's *Art of the Saracens in Egypt*.

Mamma'lia, the highest class in the animal kingdom, including all those forms with breasts (*mammæ*) by means of which they suckle their young. The group is a varied one and contains animals ranging in size from the smallest harvest mouse to whales nearly one hundred feet long. They are all air-breathers, those forms living in the water like whales, sea-cows, and seals come to the surface to breathe. The lungs and heart are in the thorax, which is cut off from the abdominal cavity by a partition—the diaphragm. They all have a four-chambered heart, a complete circulation, and red blood corpuscles without nuclei. They all possess hair at some stage of their life on some portion of the body. Even the young whales have hairs that disappear in the adult, or are confined to the snout. This covering is variously modified; it may be fine fur, wool, long coarse hair, or developed into sharp spines as in the porcupine, spiny ant-eater, and others. The outer part of the horns of ruminants is believed to be modified hairs, and the horn of the rhinoceros is regarded by many anatomists as made of compacted hairs. The other parts derived from the outer cell-layer, like claws, hoofs, the plates of the armadillo, etc., if not modified hairs are equivalent structures. The bony system of mammals is well developed. The skull articulates by two processes with the vertebral column. There are usually two pairs of limbs, but in whales and manatees the hinder pair is lacking. The brain and sense-organs are highly developed. Most mammals live on dry land; the bats, however, have the power of flight, and other forms, like the flying squirrels and flying lemurs, make long leaps through the air. Whales, sea-cows, seals, and walruses live in the water. Squirrels and others live upon trees, and among the burrowers, belonging to this class, are moles, prairie dogs, rabbits, and others. An idea of the extent of the class will be obtained by naming the orders into which it is subdivided, and the common animals belonging to each order. There are three sub-classes, viz.: ORNITHODELPHIA, DIDELPHIA, and MONODELPHIA. The first contains a single order—the *Monotremata*, represented by the duck-bill and echidna of Australia. The second contains, likewise, a single order—the *Marsupialia* or pouched animals like the opossum, kangaroo, etc. The third sub-class is the largest and most important. It embraces twelve orders as follows: *Edentata*, toothless animals, like the armadillo, hairy ant-eater, etc. *Rodentia*, the gnawers, including squirrels, hares, the mouse, rat, beaver, and the like. *Insectivora*, the insect-eaters, like shrews, hedgehogs, moles, and other similar animals. *Chiroptera*, the bats. *Cetacea*, the whales and dolphins. *Sirenia*, the dugong and manatees. *Proboscidia*, elephants, the extinct mammoth, mastodon, etc. *Hyracoidea*, the conies. *Toxodontia*, an extremely curious group, containing some extinct forms—Toxodon and Nesodon—found in South America. *Ungulata*, a very important group of hoofed animals, containing the tapir, rhinoceros, horses, swine, camels, deer, cattle, giraffe, yak, goats, sheep, antelope, musk-ox, and a few others. *Carnivora*, the flesh-eating mammals, as bear, otter, raccoon, badger, mink, dog, fox, hyena, tiger, lion, lynx, walrus, seal, etc. *Primates*, the highest order embracing lemurs, monkeys, apes, and man. See *Mammals, Living and Extinct* (1891),

by Flower and Lydekker, and Schmidt's *The Mammalia.*

Mam'moth, a very large elephant-like animal now extinct. The bones of this animal are abundant in various parts of the

MAMMOTH.

world. Fortunately, also, some specimens have been found in northern Siberia in which the flesh, the skin, and other soft parts were preserved. At the close of the 18th century, a fisherman discovered in the frozen soil of the estuary of the river Lena, a perfect animal, and, in 1846, another was found in the same locality. Both were in a state of remarkable preservation. The skeleton of the one first discovered is now in the Museum at St. Petersburg. When living, the animal resembled the Indian species of elephant, but was larger. The body was covered with a dense short wool of a reddish-brown color; besides this, there was a covering of hair several inches long, intermingled with long black bristles. There was also a shaggy mane. This animal became extinct just before the beginning of historic times. It belonged to the latest epoch (Pleistocene) of geological time. There is evidence, in the form of rude pictures scratched on ivory, to show that it lived with primitive man in southern France, and likely elsewhere. The tusks were probably present in both males and females. They were curved, in some cases almost into a circle, and in the largest specimens discovered measured about twelve feet in length. The grinding surfaces of their great molar teeth were unlike those of any other elephant, having many more transverse ridges. They fed upon the shoots and cones of the fir and pine. Their geographical range was considerable — besides those found in Siberia they were abundant in England, in Central Europe, and in the northern part of America. Their teeth and tusks are so abundant as to supply a considerable amount of the ivory of commerce. For several centuries before the discovery of the mammoth, an active trade in their ivory had been carried on. Their skeletons have been washed out of the frozen soil and deposited again. Some of the islands on the coast of Siberia are said to be made largely of accumulations of their bones. See Haworth's *The Mammoth and the Flood.*

Mam'moth Cave, The, situated in Edmonson county, Kentucky, 85 miles southwest of Louisville. The cave is about 10 miles long, but it is said to take over 150 miles of traveling to explore its many avenues, chambers, grottoes, rivers, and falls. The main cave is only four miles in length, and is from 40 to 300 feet wide, and 125 feet in height. Lucy's dome is 300 feet high. Some avenues are covered with a continuous crust of the most beautiful crystals, and there are many stalactites and stalagmites. There are several rivers or lakes connected with Green river, outside the cave, rising with the river, but falling more slowly. The largest is Echo river, three-fourths of a mile long, and in some places over 200 feet wide. The air of the cave is pure, and the temperature remains always at about 54°. See A. S. Packard's *The Cave Fauna of North America;* also, his *Inhabitants of the Mammoth Cave.*

Man, Isle of, in the Irish sea, belonging to Great Britain. It has an area of 227 square miles, with a population of 30,000, is 33¼ miles long, 12½ miles broad, and covers 145,325 acres, of which nearly 100,000 are cultivated. At the southwestern end is an islet called the Calf of Man, covering 800 acres. A chain of mountains stretches from northeast to southwest. The coast scenery is bold and picturesque, especially at Spanish Head, the southern end of the island. Large quantities of lead and zinc are mined, and smaller quantities of copper and iron. The tailless Manx cat is the only animal peculiar to the island. The extensive herring and cod fisheries, cattle and wheat raising, are the leading employments.

Of the many interesting relics of Man, Castle Rushen, probably the most perfect building of its date extant, was founded by Guthred, son of King Orry, in 947. There are left about forty Runic crosses, besides other Runic monuments. Tynwald Hill, an artificial hill, arranged in four platforms, where new laws were proclaimed, goes back to the time of the Scandinavians. The chief towns are Castletown, Douglas the modern capital, and Peel. Little is known of the Isle of Man before the 6th century. From that time it was ruled by Welsh kings till near the end of the 9th century, when the Norwegians conquered it. Scandinavian kings were in power till it and the Hebrides were ceded to Alexander III. of Scotland in 1266. After his death, the Manx placed themselves under the protection of Edward I. of England in 1290. Royal favorites governed it until 1406, when it was bestowed on Sir John Stanley and his heirs, who ruled at first as kings and afterward as lords of Man. To stop the smuggling trade carried on, the English government bought the sovereignty of the island in 1765.

The Isle of Man has a constitution and government of its own, somewhat independent of the English parliament. Its legislature,

called the Court of Tynwald, is made up of the council, and the house of Keys, or representatives chosen by the people, including women. A bill must pass both houses, be assented to by the crown, and even then is not a law till it has been proclaimed in the English and Manx languages on Tynwald Hill. The Manx are a Celtic people with a mixture of Scandinavian. The language is Celtic, but is little spoken. See Rev. J. G. Cumming's *Isle of Man;* also Scott's *Peveril of the Peak.*

Managua (*mä-nä'gwä*), capital of Nicaragua, lies in a fertile district on the south shore of Lake Managua. Population about 25,000.

Mana'gua Lake, Nicaragua, at the head of which the city of Leon, once the boast of Spanish America, was founded in 1523. It lies twelve miles northwest of Lake Nicaragua, with which it is connected by a small stream.

Manas'seh, the eldest son of the patriarch Joseph. The tribe of Manasseh was given land on both sides of the Jordan. Manasseh was also the name of the fourteenth king of Judah, who succeeded his father Hezekiah, in 697 or 699 B. C., at the age of twelve, and reigned 55 years. He rushed headlong into all manner of idolatry, and led the people with him. Carried prisoner to Babylon, he repented, and his prayer was heard.

Manatee (*măn'ă-tē'*), an aquatic mammal found along both shores of the Atlantic in tropical regions, and also in the large rivers. There

MANATEE.

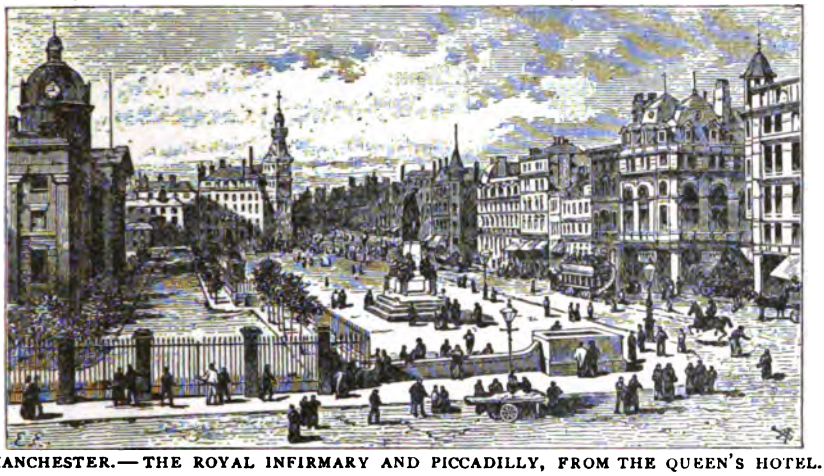
are three species known, and they all go under the name of sea-cows. One species lives on the west coast of tropical Africa, one on the eastern coast of South America, and the third on the Florida coast. The South American form is the best known; it extends to the West Indies and the gulf of Mexico, and is, possibly, the same as the Florida species. It has a long body with a broad oval tail. There are no hind limbs, but the front, flipper-like limbs are managed with much dexterity, and it was from this that it received the name of manatee. The skin is grayish in color with sparse hairs. The manatees are slow-moving, mild, inoffensive creatures, passing their whole life in the water, but, of course, coming to the surface to breathe. They are not found in the high seas, like the whales, but live along the shores in bays, estuaries, lagoons, and large rivers. They live equally well in salt and fresh water, and ascend the Amazon to Peru and Ecuador. They feed upon water grasses and marine algæ. Their size has been greatly overstated—about eight feet is the length now given by the best authorities (Flower and Lydekker). They are hunted by the Indians for their flesh. They yield also a soft, clear oil.

Man'by, George William, inventor of life-saving apparatus for shipwrecked persons, was born in 1765, at Hilgay, in Norfolk, England. He served in the militia and became barrackmaster at Yarmouth in 1803. In 1808, he succeeded with his apparatus in saving the lives of the crew of the brig *Elizabeth.* This career of usefulness he followed for the remaining 46 years of his life. He died Nov. 18, 1854. Up to the time of his death nearly 1,000 persons had been rescued from stranded ships by means of his apparatus. He first invented a rope of rawhide which would stand the strain of being fired from a mortar, also shells filled with luminous matter, which, when fired, would enable the sailors to see the rope as it came. He also invented a kind of fireworks by which vessels could be seen from the shore on the darkest night.

Man'chester, a city in Lancashire, England, lies on the east bank of the Irwell river, 31 miles east of Liverpool. Sixteen bridges, besides railroad viaducts, join it to Salford, on the opposite bank, which is really a part of Manchester. Manchester is the center of the largest manufacturing district in the world. It is surrounded by a circle of suburban cities, and within a few miles there is a second ring of cities with populations ranging from 10,000 to 50,000. Thirty miles from Manchester is a third cluster of towns and cities, most of them engaged in manufacture. The present water supply is about 25,000,000 gallons daily, but of late a further daily supply of 50,000,000 gallons has been secured. The city government manages its own lighting, at a yearly profit of over $500,000. Manchester and Salford now have eleven parks, containing 300 acres. The free reference library contains over 250,000 volumes, and there are also six branch libraries. The Chetham library, founded in 1653, contains 30,000 volumes, many of them rare and very valuable. It was the first free library in England. The "Old Church," built in 1422, is a fine Gothic structure. The magnificent town hall is a Gothic, triangular building, costing $5,250,000. The hospital, the royal infirmary, was first used in 1755. Other buildings of note are the royal institution, the royal exchange, the free trade hall, and the assize courts. The statues of Wellington, Peel, Watt, and the Albert memorial, are a few of the many monuments of Manchester. The grammar school dates from 1515. Victoria university, and especially the Technical school, are well known.

Manchester was the first town in England to introduce, about the middle of the 18th

century, the factory system, where large numbers of men work together, in place of the older method of men working in their homes. In 1756, the Bridgewater canal was constructed, which joined Manchester to the coal fields of Lancashire, the salt mines of Cheshire, and made an outlet to the sea. In 1830, Manchester had the first perfect railroad in operation. In 1887–91, a great ship canal was built at a cost of $28,750,000, which has made Manchester an inland seaport. The canal was opened for traffic in 1894, and the revenue in 1898 derived from it was close upon $2,800,000. It is 35½ miles in length, 26 feet in depth, and 120 feet in bottom width. The width of the locks is 65 feet. There are about 700 different industries carried on, but the great business is cotton manufacture, and in and around Manchester are located two-thirds of the cotton mills of Great Britain and Ireland.



MANCHESTER.—THE ROYAL INFIRMARY AND PICCADILLY, FROM THE QUEEN'S HOTEL.

Manchester is mentioned as a Roman station, but was not known as a manufacturing district till the reign of Edward III. The famous Anti-Corn Law league, which after a seven years' struggle caused the repeal of the corn laws, began in Manchester. Population 548,000. See Saintsbury's *Manchester*.

Man'chester, the largest city of New Hampshire, stands mostly on the east bank of the Merrimac river, 59 miles northwest of Boston. The river here falls 54 feet, and affords water-power to many factories. It yearly manufactures nearly 100,000 bales of cotton cloth. There are also linen and woolen factories, shoes, edge-tool, locomotive, machinery, and carriage works. The main street is 100 feet wide; there are five public squares, and the streets are well-paved. The state reform school and a Catholic orphan asylum are located at Manchester. Population 56,987.

Mandalay (*măn'dă-lā*), the capital of Upper Burma, was founded in 1860. It was captured by the British in 1885. It is in the form of a square, each side a mile long, and is surrounded by a wide moat and a wall. The most famous building is the Aracan Pagoda, with a brazen image of Buddha visited by thousands of pilgrims. The great business is silk weaving. In 1886, a flood and a fire destroyed one-tenth of the city. Population, with cantonment, 188,815.

Man'derson, Charles Frederick, an American soldier, lawyer, and politician, was born at Philadelphia, Feb. 9, 1837. He removed to Canton, O., in 1856, and was admitted to the bar in 1859. In 1861, he entered the volunteer army as a private and rose through successive grades to the rank of brevet brigadier-general. He was in many of the battles of the west and was severely wounded at Lovejoy's Station, Ga. At the close of the war he settled down to the practice of law in Stark county, O.; but removed to Omaha, Neb., in 1869. He was city attorney of Omaha for a number of years and was elected to the United States senate in 1883, where he served until 1895, being president pro tem. of the senate in the 51st congress.

Mandolin (*măn'dō-lin*), a musical instrument somewhat like the lute. The body is made by gluing together narrow pieces of different kinds of wood. A sounding board, finger board, and neck like a guitar, are added. The sound is made by a plectrum. The finest kind is the Neapolitan mandolin, with four double strings.

Manetho (*man'ē-thō*), high priest of Heliopolis, Egypt, who lived in the 3d century B. C. At the request of the king, Ptolemy Philadelphus, he wrote a history of his country, which, as shown by comparing the fragments that remain with the monuments, was written from true sources. He divided the time from Menes to the conquest of Egypt

by Darius II. into thirty dynasties. This division has been followed by all historians of Egypt.

Man'fred, regent and king of Sicily, was an illegitimate son of the emperor Frederick II., and was born in 1231. At the age of nineteen he became prince of Tarentum, regent in Italy for his half-brother Conrad, and later regent in Apulia for his nephew Conradin. He was forced by the pope to flee to the Saracens, but returning defeated the papal troops and became in 1257 master of Naples and Sicily. The next year he was crowned king at Palermo, and soon conquered all Tuscany. But Charles of Anjou, brother of King Louis IX. of France, claimed Manfred's dominions as a gift from the pope, and at the bloody battle of Benevento, in 1266, Manfred was treacherously slain. His widow and three sons died in prison, where his daughter was kept for twenty-two years. His history is a favorite subject for plays and operas. See Byron's *Manfred.*

Manganese (*man'ga-nēz'*) is one of the heavy metals. It is reddish white in color and very hard and brittle. It rusts very rapidly in the air. Pure manganese is merely a chemical curiosity, but the metal forms several important alloys. It occurs in most iron ores and pig-irons to some extent. A kind of pig-iron, called *spiegeleisen*, contains from twelve to twenty per cent. of manganese, and a metal much richer in manganese is called ferro-manganese. These alloys are used in the manufacture of Bessemer steel and other kinds of cheap steel, for without manganese these steels could not be worked. An alloy of copper and manganese, manganese bronze, is valuable for certain purposes. Manganese occurs chiefly as carbonate and as the black oxide. The latter is important in the manufacture of chlorine gas. An artificial manganese salt, potassium permanganate, is largely used in chemical processes. Manganese gives a violet tint to glass, hence small quantities of manganese oxide are put into glass to neutralize the green color produced by the iron that is accidentally present.

Man'go, a fruit of the genus *Mangifera*, which contains 27 species of tropical Asiatic trees. *M. Indica* yields the common mango and is cultivated throughout the tropics. The fruit is kidney shaped, four or five inches long, with smooth, pale green to reddish skin, and a seed almost as long as the fruit, which has a rough and fibrous shell. In the tropics the mango is a staple article of food during the hot months, more than 130 varieties being cultivated in India alone. In some of the poorer varieties the pulp is full of fibre. The mango is extensively cultivated in the West Indies and more sparsely in southern Florida and California.

Mangosteen (*man'gō-stēn'*), the fruit of a species of Garcinia (*G. mangostana*), a native of the East Indies. The mangosteen is one of the best, and is said to be one of the most luscious of tropical fruits. It is about the size and shape of an orange, with thicker rind and similar pulpy segments. Its rind is purple outside, and the flavor is said to be something between a grape and a peach. It seems to be very difficult of cultivation except in the most favored situations. In the West Indies it is cultivated in Trinidad and Jamaica, but only in certain regions of these islands.

Man'grove, the ordinary name of species of Rhizophora, which are five or six in number and widely distributed in the tropics. The commonest mangrove is *R. mangle*, and is one of the most abundant plants of the swampy shores of tropical and subtropical seas. It is an important agent in the extension of land into the sea by means of aerial roots which are put out from the branches and dangle in the wind until they reach the mucky soil beneath the water, where they strike root and become rigid. The seed also germinates while the fruit is still upon the tree, so that the young plantlets drop like plumb-bobs into the water and at once set root. In both of these ways the mangrove gradually advances seaward, and the detritus caught by the interwoven stems and roots presently builds up land.

Manila (*mȧ-nĭl'ȧ*), the chief town of the Philippine islands, and capital of the late

Spanish possessions in eastern Asia, lies on a bay in the Island of Luzon, 650 miles southeast of Hong-Kong, with which it is joined by cable. A small river divides the city into two parts. Earthquakes, typhoons, and violent thunderstorms are frequent. A hurricane in 1882 ruined half the city. The great industry is cigar-making. The exports are mainly sugar, hemp, cigars and tobacco, and coffee. The population is about 350,000, mostly native Tagals, 25,000 Chinese, large numbers being descended from these two

races, and 5,000 Spaniards. Here, on May 1, 1898, the Spanish fleet was destroyed in the bay of Manila by the American fleet under Commodore Dewey, and the islands were ceded to the United States by treaty, Dec. 10, 1898.

Manil'la Rope. See ROPE.

Ma'nioc. See TAPIOCA.

Manistee (*măn-ĭs-tē'*), a city of Michigan, is on Lake Michigan, at the mouth of the Manistee river, and 135 miles northwest of Lansing. Manistee is noted for its manufacture of sawed and planed lumber and shingles, its production of the latter surpassing, as far as known, that of any other town in the world. The region is underlayed with a bed of salt 30 feet thick, and this gives employment to a large number of people in the ten salt-works. Manistee has gas works, three foundries, and a public water supply: while a branch of the Flint and Père Marquette railroad terminates here. It was incorporated in 1867. Population 14,260.

Manitoba (*măn-ĭ-tō-bă'*). The Canadian province of Manitoba (area 74,000 square miles), was formerly known as the Red River Settlement. It is situated in the center of the continent, and is bounded on the south by the 49th parallel; on the north by the district of Keewatin and Saskatchewan; on the west by the latter and by Assiniboia; and on the east by Ontario and the unorganized northeast territories of the Dominion. It has a population of 250,000, scant as yet for its wide and finely-productive area. The growth of its capital, Winnipeg, which stands on the site of Fort Garry, the scene of the Red river rebellion of 1869–70, and one of the posts of the Hudson Bay Fur company, has been extremely rapid, especially since the establishment of railway communication. The transcontinental line of the Canadian Pacific railroad, has been a great factor in this development, as has been that of the tract southward to Pembina, with its connection with the St. Paul, Minneapolis, and Manitoba railroad. In summer, steamers on the Red and Assiniboine rivers, on lakes Winnipeg and Manitoba, and on the lower Saskatchewan, add to the facilities of communication.

Manitoba entered the confederation in 1870, and, like the other provinces of Canada, has representatives in the Dominion houses of parliament. For its own affairs, it has a local legislature, with an executive of five ministers under a lieutenant-governor. Winnipeg (population 42,336), the capital, is the seat of government. The other chief towns of the province are: Emerson, Brandon, Birke, Minnendosa, Selkirk, Virden, and Portage la Prairie. Great are the extent and capabilities of what is proudly called "the Prairie province of the Dominion." The soil of Manitoba, having originally been the bed of a lake, is mainly formed of a rich silt, deposited during the æons of the past. Nowhere is such fine wheat grown as is grown in the province, and the average yield is high. Potatoes and other root crops also yield wonderfully. The climate is extremely healthy and bracing.

Besides the Scotch settlements, there are a number of Canadian-French, a colony of which is to be found at Saint Boniface, a suburb of Winnipeg. It was among the latter, chiefly trappers, Indian half-breeds, and French-Canadians attached to the fur companies, that rebellion arose in 1869–70, and again in 1885. The leader of the rebels was Louis Riel, a French Canadian, with Indian blood in his veins, who, resenting the acquisition of the northwest by the Canadian government, usurped authority in the region and formed a provisional government at Fort Garry. A military force, under Sir Garnet (now Lord) Wolseley, was dispatched to quell the rising; but, in 1885, having broken out again, Riel and his Indian half-breeds were hanged, and the country was restored to law and order.

Manitowoc (*măn-ĭ-tō-wŏk'*), **Wis.,** the capital of Manitowoc county, on the river of the same name, on the shores of Lake Michigan, 75 miles north of Milwaukee. It has a good harbor and a considerable lake trade, and is served by the Chicago and Northwestern railroad. Its industries consist of ship-yards, tanneries, edged-tool works, agricultural implement works, foundries, machine shops, and glue factories. It has good schools, churches, and a subscription library. Population 11,786.

Mankato (*măn-kā'tō*), a city of Minnesota, in Blue Earth county, is on the Minnesota river, 86 miles southwest of St. Paul; it is situated in a very fertile region. Steamboats can ascend the river to this point, and three lines of railroad pass through the city. The state normal school is located here, and there is a city hall, court house, sixteen churches, a Roman Catholic college, a public library, six weekly papers, nine hotels, and three banks. It manufactures tiles, flour, oil, woolens, wooden-ware, brick, cement, etc. The town is lighted with gas, and has a public water supply. It was settled in 1853 and incorporated in 1868. Population 10,599.

Mann, Horace, an American educator and reformer, was born at Franklin, Mass., May 4, 1796. He was graduated at Brown university in 1819, and began to study law. As a member of the state legislature, he founded the state lunatic asylum. In 1833, he became president of the state senate. For eleven years he was secretary of the Massachusetts board of education. He subsequently abandoned politics and business and gave his whole time to the cause of education, working generally fifteen hours a day. He became John Quincy Adams' successor in congress in 1848, where he opposed the extension of

slavery. He was president of Antioch college, Ohio, from 1853 till his death, Aug. 2, 1859. See his *Life*, by Mrs. Mann.

Man'na, a sugary substance obtained from the manna ash tree by making crosscuts into the stem. This tree is grown in Sicily and Calabria mainly for its sap, called manna. In July and August deep cuts are made near the base of the tree, and, if the weather is warm enough, the manna begins to ooze out of the cuts slowly and hardens into lumps or flakes. Manna is light and porous, in the form of crystals, easily broken, yellow in color, and with a sweetish, somewhat bitter taste. There are several other manna-yielding plants besides the ash, as the manna-bearing eucalyptus of Australia. The manna eaten by the Hebrews in their wandering in the wilderness was what is now called Mount Sinai manna, which falls to the ground from the branches of a kind of tamarisk. It oozes out through holes made in the bark by little insects. It is not true manna, but is a kind of reddish, sticky syrup, and is eaten by the monks of Mount Sinai like honey with their bread.

Man'ning, Henry Edward, Cardinal, was born July 15, 1808, at Totteridge, Hertfordshire, England. He was educated at Oxford, and soon came to the front as an eloquent preacher, and as leader of the well-known tractarian party in the English church. In 1851, he joined the Catholic church. He studied for a time at Rome, was made provost and then archbishop of Westminster. In the church council of 1870 Manning favored the doctrine of the pope's infallibility, which was then declared. He was made cardinal in 1875. Besides being foremost in most Catholic movements in England, he took part in many good works for bettering the social life of the people, such as the temperance movement, housing the poor, education, and the rights of workingmen. During the great strike of London dock-laborers he was the only man in England to whom the strikers would listen, and his arbitration of the strike made him, for the time, perhaps the most influential man in the country. A great churchman and a reformer, he was also an accomplished man of the world and scholar. Among his writings are, *Characteristics*, *The Catholic Church and Modern Society*, *Four Great Evils of the Day*, *Temporal Power of the Pope*, and *England and Christendom*. Cardinal Manning died at Westminster, Jan. 14, 1892.

Manometer (*ma-nŏm'e-tĕr*), an instrument for measuring fluid pressures. There are three principal types of manometers. The simplest type is merely a U-tube partially filled with mercury, and open at both ends. If now one arm of the U-tube be connected with the vessel in which the pressure is to be measured, the level of the mercury in the other arm will change; and the difference of level between the two arms *plus* the barometric height will give the pressure in the vessel. Water is sometimes used instead of mercury. This kind of manometer is shown in Fig. 1.

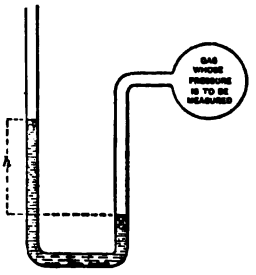
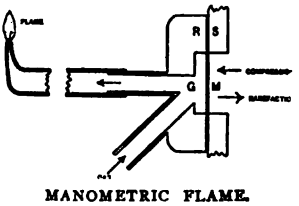


FIG 1.

The *second* type of manometer is one in which a U-tube is also employed — but a U-tube with one end sealed off and inclosing a definite amount of gas. The open end being connected with the vessel in which the pressure is to be measured, the volume of the gas inclosed in the other end is changed. And, by use of Boyle's Law, the pressure may be computed as soon as the volume of the inclosed gas is known. Lord Kelvin's deep-sea sounding apparatus is merely a manometer of this type by which the pressure at any point in the sea is measured. From this pressure, the depth of the sea is computed.

A *third* type of manometer is the one commonly employed on steam boilers and known as a *pressure gauge*. This device consists of a flattened and curved metallic tube which changes shape as the difference of pressure between the inside and outside is changed. It was invented by Bourdon and is frequently called a *Bourdon gauge*. See article ANEROID BAROMETER. One end of this gauge is fixed, while the other end is free to move an index which shows the pressure on a graduated dial.

Manometric (*man'o-mĕt'rik*) **Flame,** an instrument for exhibiting to the eye the disturbances which a sound produces in the air, was invented and perfected by Rudolph König of Paris. In the figure, R and S represent two blocks of wood which have been bored out. A diaphragm of goldbeater's skin is clamped between these two blocks and thus divides the whole apparatus into parts. Illuminating gas is admitted to the left-hand side of the apparatus as indicated by the arrows, and burns with a quiet flame so long as the diaphragm is undisturbed. If, however, the air on the right of the diaphragm is suddenly compressed, the flame will flare; and if this air is suddenly rarefied the flame will for an instant burn low. The effect of a sound wave striking this diaphragm is then to drive it alternately forward and backward, making the flame pulsate. These acoustical disturbances are, however, so rapid that the changes in the height of the flame are not



MANOMETRIC FLAME.

easily seen. Accordingly, the flame is generally observed in a rotating mirror, which serves to separate the images of the flame at successive instants. In practice, the block, S, is generally provided with a mouthpiece or with a tube to lead the sound up to the diaphragm, M. This instrument is used to exhibit, in the most beautiful manner, the qualities of various sounds, as, for instance, the difference in the various vowels pronounced by the same voice.

Mans'field, a city in the central part of Ohio, 65 miles northeast of Columbus. It is situate in the midst of a fine farming country, on an elevated site. It has a large trade, and manufactures threshing machines, woolens, paper, boilers, carriages, furniture, and flour. It is the home of Senator Sherman. Population 17,640.

Mans'field, Richard, an actor, was born on the island of Heligoland, May 24, 1857. He first appeared as a musician in Liverpool in 1877, and for some years after that was seen only in small parts in comic operas. His first marked success was achieved in New York at the Union Square theatre in January, 1883, as the "Baron de Chevreul" in a Parisian romance. Three years later he appeared as a star in the Madison Square theatre, New York, in *Prince Karl*. Later he took the part of "Dr. Jekyll and Mr. Hyde," in the dramatized form of that well-known work. On Sept. 12, he appeared at Daly's theatre, New York, in *The Scarlet Letter*. He appeared as "Cyrano de Bergerac" in 1899.

Mans'field, William Murray, Earl of, lord-chief-justice of England, was born at Perth, Scotland, March 2, 1705. He graduated from Oxford in 1730, and after studying for the law, he soon secured a large practice, chiefly because of his force as a speaker. In 1743, he was made solicitor-general, and entered the house of commons, where he took high rank. He was consul against certain rebel lords in 1764, appointed chief-justice in 1756, and the same year became a member of the house of lords and of the British cabinet. Although he was fair in his decisions as head of the king's bench, his opinions were not on the popular side, which abused and hated him. The famous then unknown Junius attacked him, and during the Gordon riots of 1780 his house, with all his books and papers, was burnt. He would not allow parliament to repay his loss. He died at London, March 20, 1793. See Campbell's *Lives of the Chief-Justices*.

Man'son, George, a Scottish water-color painter, was born at Edinburgh, Scotland, Dec. 3, 1850. For five years he worked as a wood engraver, studying art in his spare hours morning and evening. His first noted picture, *Milking Time*, was painted between four and eight o'clock in the mornings of a whole summer. Hard work and study ruined his health, and he died in Devonshire, England, Feb. 27, 1876. His pictures are mostly from common life and are charming for their beauty of drawing and color. See P. G. Hamerton's *Graphic Arts*.

Mantegna (*măn-tăn'yȧ*), **Andrea,** an Italian historical painter, was born near Padua, Italy, in 1431. He was the adopted son of a tailor in whose house he studied the collections of ancient paintings and sculpture which he took as his models. He did not aim at grace and beauty, but at dignity and truth, and some of his pictures are even ugly. His genius showed itself early, and he was but seventeen when he set up a studio. His early paintings were frescoes of saints and altar-pieces for churches. In 1459, he made his home in Mantua, though making a visit to Rome to paint frescoes for Pope Innocent VIII. His masterpiece is a series of nine pictures showing the *Triumphs of Cæsar*. Others were *Parnassus*, *Defeat of the Vices*, and *Triumphs of Scipio*. Mantegna was also an engraver and architect, and is said to have been a poet and sculptor. He had great influence on Italian art. He died at Mantua, Italy, Sept. 13, 1506.

Manteuffel (*măn-toif'fel*), **Edwin Hans Karl, Freiherr von,** a Prussian general, was born at Dresden, Feb. 24, 1809. He entered the army in 1827 and became head of the military bureau at Berlin in 1857. Having been made commander of the Prussian troops in Sleswick, he marched into Holstein in 1866 to prevent the summoning of the estates. He took part in the battle of Langensalza, which brought about the surrender of the Hanoverian army. As commander-in-chief of the army of the Main, he won the battles of Werbach, Tauberbischofsheim, Helmstadt, and Rossbrunn over the Bavarians and others, the south German allies of Austria. As commander of the first army, he fought successfully at Amiens and other places in the war of 1870. In 1871, Manteuffel attacked the French near Belfort and drove 80,000 men across the frontier into Switzerland. In 1879, he was made viceroy of the conquered provinces of Alsace and Lorraine. He died at Karlsbad, Bohemia, June 17, 1885.

Mantua (*măn'tū-ȧ*), a fortified city of northern Italy, and formerly the capital of the duchy of Mantua, is on two islands formed by the Mincio river. The marshy district around it, and its fortifications, make it perhaps the strongest fortress in Italy. It has broad streets and many open squares. The fortress of the Gonzagas, adorned with paintings by Mantegna, the cathedral of San Pietro, and the church of San Andrea, are its chief buildings of interest. Virgil was born at Pietole, now a suburb of Mantua. Mantua was first an Etruscan town, then it belonged to the Romans, Ostrogoths, and Lombards. The Gonzaga family became its rulers in 1328, and

not only maintained themselves against their great rivals, the Visconti of Milan, but raised the city to the height of its splendor and renown. Mantua became a part of Austria in 1708, who held it till 1866, except for two short periods, when it was in the possession of France. In the latter year, it was ceded to Italy. The city has had three great sieges — by the emperor Ferdinand II. in 1630, by the French in 1797, and by the Austrians in 1799. Population 30,217.

Man'ual Training in Public Schools. In 1868 Victor Della Vos, director of the Imperial Technical school for government engineers at St. Petersburg, conceived the plan of teaching certain kinds of tool-work by means of models and drawings and practice exercises, before any attempt should be made at the execution of trade-work. The exhibition made by his school at the Centennial exposition in Philadelphia, in 1876, directed the attention of American educators to a system which it was felt could be made of inestimable value to the young people of the United States, many of whom remained in school only long enough to conceive a distaste for manual labor, but not long enough to acquire professional culture. It was believed that these experiments opened a door to an education which combined the intellectual and physical; that both mind and body might be disciplined by processes which broadened the man, fitting him to become a useful member of the community and also a producer of wealth. It was maintained that the powers of observation, judgment, and induction could be cultivated, not only in schools of philosophy and science, but in schools of trade and technology. Considering the fact that only about one-sixth of the pupils entering the ordinary high school complete the course, and that most of those passing through the grammar school do not enter the high school at all, it seemed that some course should be adopted which would retain the majority of young people under pedagogic care by a combination of purely intellectual studies with those having an economic aspect. The result of attempting two such diverse ends has naturally given rise to rival schools, in one of which the intellectual aim, in the other of which the economic purpose, prevails. But it is perhaps best that the new system should not stiffen into set lines too early, or be at the outset forever and invariably fixed. Different classes in society and different localities in our states may well vary the curriculum according to ascertained needs. In most of our larger cities manual training schools form an accepted part of the public secondary instruction, to which a course in the grade school and grammar school is pre-requisite. Those private institutions which are perhaps now best known are the schools connected with the Drexel institute, Philadelphia; the Washington university, St. Louis; the Armour institute, Chicago; and that under the care of the Massachusetts Institute of Technology, Boston. The curriculum most favored in these institutions embraces, in mathematics, algebra, trigonometry, astronomy, and mechanics. In science, botany, chemistry, and physics, with elementary lessons in biology and geology, are introduced. Composition and rhetoric are not neglected, and in some schools excellent instruction is given in Latin and in modern languages. As specially distinctive of these schools, however, marked attention is paid to drawing, clay modeling, tinting, joinery, wood carving, forging, and founding. In some schools sewing and cooking are also taught. The result so far has been to retain many youth in school who would otherwise have cut their courses short; and the work done in these schools promises to make itself felt in raising the standard of mechanical execution in all the states of the Union.

Manzoni (*mȧn-zō'nē*), **Alessandro**, a great Italian novelist and poet, of the romantic school, was born at Milan, March 7, 1785, of a noble family. He published his first poems in 1806; sacred lyrics and two tragedies, one highly praised by Goethe, followed; but the work which gave Manzoni European fame was his historical novel, *I Promessi Sposi* ("The Betrothed Lovers"), a Milanese story of the 17th century, a powerful work, and interesting from its sketches of Italian life and customs, and especially the account of the plague in Milan. His famous ode, *Il Cinque Maggio* ("The Five Great Ones") was inspired by the death of Napoleon. He died at Milan, May 22, 1873.

Map, a drawing on a plane of the surface of the earth. As the earth is a sphere, it cannot be exactly represented on a plane or level surface, and various methods have been adopted to do away with the difficulty. The arrangement of the lines of latitude and longitude in circles is the most common way, and answers the purpose fairly well. The lines of latitude are numbered north and south from the equator, and the longitude east or west of a given line, usually either Greenwich, England, or Washington, in the United States. This serves to indicate the position of a country. Maps are made on a certain scale; as, one inch of the map may represent one mile of the country. Different colors are used to mark different countries, and water, mountains, high plains, etc., are also often indicated in the same way. The art of making maps is ancient, the Egyptians having made some rude attempts, though the Greeks consider Anaximander (560 B. C.) as the pioneer map-maker. In the 15th century, the revival of Ptolemy's teachings made a change in the charts made; Mercator and others among Italians and Germans made valuable contributions in the 16th century, and Sebastian Cabot made his map of the

world in 1544. A topographical map represents the details of a country very minutely, as the mountains, hills, rivers, and plains. A hydrographical map is one representing the waters of the world, as oceans, seas, bays, etc., with their coasts.

Ma'ple, a species of the genus Acer, being mostly trees well known by their palmately lobed leaves and winged fruits. The genus contains about 100 species, and is distributed throughout the temperate regions of the northern hemisphere. They are among the most prized of trees for park and street planting, and nearly all of them become finely colored in autumn. Among the numerous well-known species are *A. saccharum*, which produces the maple sugar and is perhaps the best and most popular of the maples for shade; and *A. saccharinum*, the "silver maple," with numerous varieties, is a quick-growing tree. Other prized forms are the "red" or "scarlet maple" (*A. rubrum*), which is common for street and park planting; "black maple" (*A. nigrum*); "Norway maple" (*A. platanoides*), resembling the sugar maple somewhat and occurring in numerous garden forms; the "box elder" (*A. negundo*), which is much used in the west.

Maple Sugar is made from the sap of the sugar maple, which grows in the northern part of the United States and in Canada. The trees are tapped in the spring, when there are warm days and frosty nights, which help the flow. A hole is made in the trunk with an auger or ax, in which a spout is stuck, through which the sap flows into a trough. It is then carried to a receiver, and, after straining, to the boiler. It is boiled and refined in the same way as cane sugar. A single tree yields from two to six pounds in a season. Good vinegar is made from it, and maple syrup, much better than sugar molasses, which is much used on buckwheat cakes, etc. New England is the great maple sugar region, but it is also made in Indiana, Michigan, New York, Ohio, and Pennsylvania. The yearly output of the United States is about 35,000,000 pounds.

SUGAR MAPLE.

Maracaibo (*mă-ră-kī'bō*), **Gulf of,** a wide inlet of the Caribbean sea, joined by a strait with the lake of the same name. The lake forms the floor of a great valley, shut in by high mountains. Its waters are sweet and deep enough for the largest vessels, but the mouth makes it difficult to enter. The gulf and lake were discovered in 1499 by Ojeda, who found here houses built on piles, and so called the region Venezuela — "Little Venice."

Marat (*mă-rä'*), **Jean Paul,** one of the foremost men in the French Revolution, was born at Boudry, in Neuchâtel, Switzerland, May 24, 1744, the son of a physician. He studied medicine and practiced for a time at London, becoming noted as a student of optics and electricity, his work and writings attracting the attention of Franklin and Goethe. In 1788, he started his famous paper, *L'Ami du Peuple* (The Friend of the People). Throughout the Revolution he fought for his own hand, denouncing in turn Necker, Bailly, Lafayette, the king, Dumouriez, and the Girondins. His paper made him hated, but made him also the darling of the scum of Paris, and placed great power in his hands. His printing press had to be hidden from the eyes of Lafayette's police; twice he had to flee to London, and once was forced to hide in the sewers of Paris. There is no doubt that on his head rests in great measure the guilt of the September massacres. He was chosen a member of the convention, and was perhaps the most unpopular man in the house. When the republic was set up, Marat changed the name of his paper to the *Journal of the French Republic*. He was now dying of a disease caught in the sewers, and his last energies were spent in a death-struggle with the Girondins. Marat was accused by them before the tribunal, and his acquittal marked their own downfall. He was now so weak that he could only write sitting in his bath, where Charlotte Corday's knife put an end to him, July 13, 1793. The beautiful Charlotte, whose lover had been killed by a mob, and who said she had stabbed one man to save the lives of one hundred thousand, was guillotined, while Marat was buried with the greatest honors. See the *Histories of the French Revolution*, by Mignet, Thiers, Michelet, Louis Blanc, Carlyle, and Von Sybel.

JEAN PAUL MARAT.

Marathon (*măr'a-thon*), a village on the coast, 18 miles northeast of Athens, Greece. Here the Persian hordes of Darius were defeated, in 490 B. C., by the Greeks under Miltiades — one of the decisive battles of the world. The Persians numbered about 110,000. Against them came 10,000 heavy-armed

Athenian infantry and a small body of light-armed troops. A re-enforcement of 1,000 heavy-armed Platæans encouraged Miltiades to leave his position on the heights and attack the Persians who filled the plain below. The Greeks advanced in three bodies. The two wings carried everything before them, but the center was driven back. The wings now fell on the flanks of the Persian center and drove the whole army to their ships, which were drawn up on the beach. The Persian loss is put at 6,400; that of the Greeks at but 192. Had the Athenians been conquered, all Greece would have become a part of Persia.

Maratti (*mä-rät'tē*), **Carlo,** an Italian painter, was born near Ancona, Italy, in 1625. He studied at Rome and became a great admirer of Raphael's paintings. A picture of Constantine destroying the idols made him one of the first painters of his time. His masterpiece is the *Martyrdom of St. Biago*, at Genoa. He died at Rome, Dec. 15, 1713.

Mar'ble. In its popular sense, the term "marble" is applied to any crystalline rock composed principally of lime carbonate or of lime and magnesia carbonates, if it has a color which makes it desirable for decorative or monumental purposes, or for building stone, and a texture which renders it susceptible of polish. In origin, it is generally a metamorphosed limestone. It therefore occurs chiefly in regions of metamorphic rock. Between limestone which is not crystalline, and marble, there are all gradations, and thoroughly crystalline limestone, if it is not valuable for some of the purposes mentioned above, is rarely called marble. The color of marble depends on the purity of the limestone from which it is made. If considerable quantities of materials other than lime carbonate or magnesia carbonate are present, the color depends upon the nature and distribution of these impurities in the rock. Pure marble is white, but impurities may make it red, brown, yellow, black, or, if the impurities be irregularly distributed, the marble may be mottled or clouded. Onyx, or onyx marble, is a variety of marble formed by the precipitation of lime carbonate in solution, usually from the waters of springs. All limestone formed by precipitation is *travertine*, which includes stalactites, stalagmite, etc., but only those varieties of travertine which have beautiful colors, and are translucent, are called onyx. Onyx is used for decorative purposes in the interiors of buildings, for wainscoting, lavatories, etc. The onyx of ancient time was derived principally from Egypt. The principal American sources are Mexico, the peninsula of Lower California, southern California, and Arizona. The colors of onyx are various, white, yellow, and green being common. It is often mottled and beautifully veined. Certain varieties of variegated serpentinous rock are sometimes called verdantique marble. Marble is widely distributed, but the commercial product of the United States is derived mainly from the following states, named in the order of the value of their marble products in 1898: Vermont, Georgia, New York, Tennessee, Maryland, California, Pennsylvania, Massachusetts. The total value of the marble output of the United States in 1898 was over $3,500,000, and more than one-half of this came from Vermont.

Marc'anto'nio or **Raimon'di,** an Italian engraver, was born at Bologna late in the 15th century. He was a goldsmith by trade. He copied, on copper, wood engravings of Dürer, and at Rome, where he worked from 1510, he engraved many of Raphael's paintings, and is held to be the greatest of the engravers of the great painter. He died in 1534.

Marcel'lus, Marcus Claudius, a famous Roman general, came of a plebeian family. In his first consulship—222 B. C.—he defeated a part of the Gauls and slew their king with his own hand. In the second Punic war he took command after the defeat at Cannæ and checked the victorious Hannibal at Nola in 216. Two years later, as consul for the second time, he blockaded Syracuse, and helped by famine and pestilence, and by the treachery of the Spanish allies of the Syracusans, he entered the city in 212, and soon conquered all Sicily. In his fifth consulship—208 B. C.—he fell in a skirmish against Hannibal, near Venusia, Apulia.

March, the third month of the year and the first in the Roman calendar, has 31 days. It was held to be the first month in England till the change of style in 1752. Its last three days were once supposed to have been borrowed from April, and according to an old proverb are always stormy. March is named after the Roman god, Mars.

March, Francis Andrew, an American philologist and scholar, was born at Millbury, Mass., Oct. 25, 1825. He graduated at Amherst college in 1845, where he was tutor for two years. After studying law, and teaching for three years, he became instructor at Lafayette college, where he has since taught, from 1858 being professor of the English language and comparative philosophy. Professor March ranks as one of the first of American philologists. He has published *An Anglo-Saxon Grammar*, *A Method of Philological Study of the English Language*, etc.

Marchantia (*mär-kan'shĭ-a*), a genus of plants belonging to the liverworts, whose species have prostrate and thick thallus bodies, which put out rhizoids from the under surface, and are green on the upper surface. Small cups ("cupules") also are borne on the upper surface, which contain numerous disk-like gemmæ for vegetative propagation.

Each thallus body also sends up a conspicuous vertical branch, on the summit of which is a disk bearing the sex organs. The disk with scalloped edge bears the male organs (antheridia), while the star-shaped disks bear the female organs (archegonia). The most common species is *M. polymorpha*, abundant on damp ground and moist cliffs. See HEPATICÆ for figure.

Marchesi (*mär-kā'sē*), **Pompeo,** an Italian sculptor, was born in 1789. He was a pupil of Canova, became professor in the Academy of Fine Arts, and one of the foremost sculptors of modern Italy. His masterpiece is *The Good Mother*, the Virgin with the dead Christ in her lap, which is in the church of San Carlo at Milan. Other works are his statues of *Goethe* at Frankfort, *Venus Urania*, and *St. Ambrose*. He died at Milan, Feb. 7, 1858.

Marco'ni, William, a distinguished electric engineer, born at Marzabotto, Italy, in 1875, and educated at the University of Bologna, especially under the direction of Professor A. Righi, an eminent physicist and high authority on electrical vibrations.

Marconi's chief accomplishment is the perfection of a system of wireless telegraphy by use of Hertzian vibrations. His first successful experiments were performed in England in 1896. See MAXWELL, JAMES CLERK-.

Marco Polo. See Polo.

Mar'cy, William Learned, an American politician, was born at Southbridge, Mass., Dec. 12, 1786. He was brought up on a farm and graduated at Brown university in 1808. He became a lawyer, but when the War of 1812 broke out he entered the army as a lieutenant. He went with a detachment to capture some Canadian militia at St. Regis. Though not the commanding officer, Marcy led the attack, broke open the door of the blockhouse, and forced the militia to surrender. These were the first prisoners taken on land in the war. For some years he was editor of a Democratic paper at Troy, N. Y. In 1823, he was chosen comptroller of the state; in 1829, was appointed justice of the state supreme court; and two years later became United States senator. In 1832, he resigned to become governor of New York, was twice re-elected, but was defeated by Seward in 1838. He was secretary of war in Polk's administration, which covered the era of the Mexican war. He was also of great service in the settlement of the Oregon boundary question with England. As secretary of state under Pierce, he carried on the foreign affairs of the government in a masterly manner. Throughout his public life he showed great ability as a writer, statesman, and diplomatist. Marcy was the author of the famous political maxim, "To the victors belong the spoils." He died at Ballston Spa, N. Y., July 4, 1857.

Mardi Gras (*mär'dē-grä*), meaning "fat Tuesday," the day before Ash Wednesday, (the first day of Lent), the same day that was formerly celebrated in England as "Shrove Tuesday." The custom of holding high carnival and making merry on that day was observed for hundreds of years in Europe and is still kept up in some of the southern cities of the United States, especially at New Orleans. It was introduced there in 1827 by Creoles who had taken part in the festival at Paris. The day is a legal holiday, and all the afternoon the streets are filled with masqueraders, and balconies and windows with spectators. An ox, with its horns covered with wreaths, heads a procession of butchers. The carnival king "Rex" appears at noon, the papers having beforehand announced his landing at New York or some other port, and told of his courage in war. He is represented usually as a gray-bearded, dignified man. Two pages go before him carrying his scepter and the keys of his kingdom on velvet cushions. There is also a night parade of young gentlemen maskers dressed to represent some poem, as *Lalla Rookh*, or a feast, the Darwinian theory, etc. The day ends with a ball, where Rex chooses his queen.

Maren'go, a village near Alessandria, of northern Italy. Here, on June 14, 1800, Napoleon with 33,000 French defeated 30,500 Austrians under Melas. The absence of Napoleon when the fighting began came near giving the Austrians a victory. It was the cavalry charge of the younger Kellermann that decided the day, and gained upper Italy for France. The Austrian loss was 6,400, besides 3,000 prisoners; the French loss 7,000. General Desaix was among the killed.

Mar'garet, queen of Denmark, Norway, and Sweden, was the daughter of Waldemar IV. of Denmark, and wife of Hacon VIII. of Norway. She was born in 1353. By the death of her father she became regent of Denmark in the name of her son, who soon died, and then of her grandnephew Eric of Pomerania. The death of her husband made her ruler of Norway (1388), and the dissatisfied subjects of Albert, king of Sweden, asked her to take that country too. She sent an army into Sweden which defeated the king's troops and took Albert and his son prisoners. Sweden was wholly conquered, and in 1397 the famous union of Kalmar was agreed upon, whereby the three kingdoms were to stay forever at peace under one king, though each was to keep its own laws and customs. Margaret also got possession of Lapland and part of Finland. She was a woman of great energy and strong will, and ruled with a firm hand. She has been called the "Semiramis of the North." She died Oct. 28, 1412.

Margaret of Anjou (*mär'ga-rĕt of on-zhōō'*), queen of England, wife of Henry VI., and daughter of René of Anjou, titular king

of Sicily and Jerusalem, was born at Pont-à-Mousson, in Lorraine, March, 1429. At the age of fifteen she was married to King Henry VI. of England, then in his twenty-fourth year. The queen soon proved herself superior to her husband in force of character and in executive qualities; and when the English threatened the security of the throne, because as a condition of her marriage all the English possessions in France were surrendered to the French except the single town of Calais, she proved herself to be the real ruler of the kingdom and the commander of the English armies. She had been married but five years and was only twenty years old when the insurrection of Jack Cade occurred, when for a time the city of London was in the hands of the mob; and soon after began the Wars of the Roses, the title of her husband to the throne being disputed in arms by the Duke of York, who was descended from an elder brother than was Henry VI. But Margaret defeated the Duke, and he was slain in battle at Wakefield (1460); and by the second battle of St. Albans she released her husband, at that time a captive in the hands of his enemies. By the help of Warwick, "the kingmaker," she succeeded in seating her husband once more upon the throne; but Warwick being soon after killed at Barnet, Margaret fell into the hands of the Yorkists and was imprisoned in the Tower of Windsor until 1475 when she was ransomed by Louis XI. of France, who paid 50,000 crowns for her release. Margaret sought refuge in France and died at Dampierre, Aug. 25, 1482, but little over fifty years of age, having spent twenty years of her life in constant war and four years in prison.

Mar'garet of Navarre (*nä-vär'*), sister of Francis I. of France, was born at Angoulême, France, April 11, 1492. She was carefully taught and very early became popular because of her charm of manner and strength of mind. After the death of her first husband, the duke of Alençon, she married Henri of Navarre, and so became the grandmother of the great French king, Henry IV. She encouraged farming, arts, and learning, and courageously sheltered reformers like Marot and Bonaventure. Her writings include interesting letters, poems called *The Marguerites of the Marguerite*, and the noted *Heptameron*, stories modeled on the *Decameron* of Boccaccio, which most scholars believe to be the joint work of Margaret, Bonaventure, and other men. See her *Life*, by Miss Freer, also her *Letters*, which appeared in England in 1841–42. She died at Bigorre, France, Dec. 21, 1549.

Margaret, Saint, queen of Scotland, was born in Hungary in 1047. From her tenth year she was brought up at the court of Edward the Confessor, her great-uncle. In 1068 with her mother and sister and young brother, Edgar the Atheling, she fled to Scotland. Young, lovely, learned, and good, she won the heart of the Scottish king, Malcolm Canmore, who married her the next year (1069). She did much to civilize Scotland, and built a fine church at Dunfermline. She had the greatest desire to help the people among whom her lot was cast, was very religious, and unselfishly did whatever duty lay before her. She died at Edinburgh, Nov. 16, 1093, and one hundred and fifty-seven years later was made a saint by Pope Innocent IV. See Skene's *Celtic Scotland*.

Margate, an English seaport in the Isle of Thanet, at the eastern extremity of Kent, has for many years been (with Ramsgate) a famous seaside resort. Its bracing air, good bathing, and fine beach attract thousands of visitors. Its long pier, jetty, theatre, "zoo," old churches, and town hall are some of the features of the place. Here were landed the wounded brought back from the field of Waterloo, and here the painter Turner went to school. Population 18,900.

Maria Christina (*mä-rē'ä kris-tē'nä*), queen of Spain, was born at Naples, Italy, April 27, 1806. She was the daughter of Francis I., king of the two Sicilies, and became the fourth wife of Ferdinand VII. of Spain. On Ferdinand's death in 1833, she became regent in the name of her daughter, Isabella. During the civil war of the Carlists, which threatened her power, she was deaf to everything but her love for her second husband, the Chamberlain Munoz. In 1836, a conspiracy forced her to yield a constitution to the people. Another rising in 1840 forced her to give up the regency and go to France. Returning in 1843, she was exiled by the patriotic party in 1854, but was back again ten years later, and driven out finally in 1868. She cared little for the Spaniards, except to keep her own power in the country. Maria died at Havre, France, Aug. 22, 1878. See Furley's *In Spain amongst the Carlists*.

Maria Louisa (*mä-rē'lō-ē'za*), empress of the French, second wife of the Emperor Napoleon I., was the daughter of the Emperor Francis I. of Austria. She was born Dec. 12, 1791, and married to Napoleon, after the divorce of Josephine, April 2, 1810. She bore a son to the emperor March 20, 1811, who was called king of Rome. At the beginning of the campaign of 1813 she was appointed by the emperor regent during his absence, but with many restrictions upon her authority. On the overthrow of Napoleon, she went first to Orleans and then to Rambouillet. Later she made Schönbrunn her home, where she remained until 1816. She received by the peace of Paris, the duchies of Parma, Piacenza, and Guastalla. After the death of Napoleon, she married Count Neipperg. She died at Vienna, Dec. 17, 1847.

Maria Theresa (*ma-rē'ä te-rē'sä*), empress of Austria, was the daughter of Charles VI.,

and was born at Vienna, May 13, 1717. Her father got the powers of Europe to sign the pragmatic sanction which gave the right of succession to the throne to the females as well as to the males of the royal line. When she came to the throne, in 1740, she found the government without money, the people discontented, and the army weak; while Prussia, Bavaria, Saxony, and Sardinia put forward claims to all or parts of her dominions. Frederick the Great poured his armies into Silesia; Spain laid hands on Austrian Italy, and the Bavarians invaded Bohemia and threatened Vienna. The young queen was saved by the chivalrous faithfulness of the Hungarians, to whose loyalty she appealed with her baby son in her arms, and by her own courage and energy. The Seven Years' war of the Austrian succession ended with the peace of Aix-la-Chapelle, in 1748, by which Maria lost territory to Prussia, Spain, and Sardinia, but had her rights recognized, and also those of her husband, Francis, grand-duke of Tuscany, who was crowned emperor. In the years of peace that followed she fostered farming, manufactures, and trade, nearly doubled the national revenues, and at the same time lessened the taxes and strengthened her armies. But the loss of Silesia rankled deeply in her mind, and she began the Seven Years' war with Frederick the Great, which only served to strengthen his hold on the lost province. She then endeavored to strengthen the country in every way, bettered the condition of the peasants, ameliorated criminal punishments, and founded schools and charitable societies. By the first partition of Poland she got Galicia and Lodomeria, and obtained Bukowina from Turkey. Maria Theresa was majestic and winning, and had the undaunted spirit of a true queen. She won the love of her subjects and raised Austria from a wretched condition to power. She died at Vienna, Nov. 29, 1780. See *Maria Theresa and Frederick the Great*, by Duc de Broglie; and narratives of the Seven Years' war.

Mar'iazell', a famous place of pilgrimage in Austria, is in Styria, 60 miles southwest of Vienna. The image of the Virgin, which draws thousands of pilgrims yearly, is enshrined in a magnificent church, built in 1644 A.D.

Marie Antoinette (*mă-rē' ŏn-twă-net'*), **Josephe Jeanne,** the most ill-fated of the queens of France, was the fourth daughter of Maria Theresa of Austria and was born at Vienna, Nov. 2, 1755. She was married to Louis XVI. of France, then the dauphin, in 1770. A mere child in years, neglected by her young husband, and bored by the stiff etiquette of the old court of France, she spent money recklessly, went on night drives to Paris, appeared at masked balls, and became passionately fond of the card-table. When, in 1774, she became queen, her open favoring of Austrian interests, and her enmity to Turgot and Necker, and their measures for stopping the distress of the country, made her distrusted and disliked. The people came to think that the miseries of France were wholly caused by the extravagance of "the Austrian," as she was called. She was also attacked in pamphlets under the names of "Madame Deficit" and "Madame Veto." The joyous girl had now become a courageous and obstinate woman, who forced the king into a backward policy, to his undoing. As Mirabeau said, the only man the king had about him was his wife. Amid the horrors of the march of women to Versailles, she alone did not lose heart, and she showed herself on the balcony to the raging mob with a cool bravery that for a moment overawed the fiercest into respect. But she was a Royalist to the core, disliked liberal noblemen like Lafayette and Mirabeau, and utterly failed to understand the troublous times into which she was flung. The death of Mirabeau, in 1791, took away the last hope of saving the monarchy, and less than three months later took place the fatal flight to the frontier which was stopped at Varennes. Quickly followed the storming of the Tuileries, the transference to the Temple, the trial and execution of the king, and then Marie's son was torn from her arms, and she herself sent to the Conciergerie like a common criminal. After eight weeks more of insult and brutality, the "Widow Capet," as she was styled, was herself tried in her ragged dress and gray hair before the revolutionary tribunal. With calmness she went through the two days and nights of questioning, was sentenced, and on the same day at Paris on Oct. 16, 1793, perished under the ax of the guillotine, just twenty-three years after she had left Vienna, a beautiful girl. See the histories of the French revolution by Thiers, Mignet, Michelet, Louis Blanc, Carlyle, and Von Sybel; and Lord Ronald Gower's *Last Days of Marie Antoinette.*

Marietta, a city of Ohio, capital of Washington county, on the Ohio river, at the mouth of the Muskingum, 95 miles southeast of Columbus. Founded in 1788, largely by officers of the Revolutionary war, it is the oldest town in the state, and the first settlement in the Northwest Territory. Remarkable traces of the early moundbuilders are visible here. It is the seat of Marietta college, founded in 1835, and having 13 professors and instructors, 200 students, and a library of 45,000 volumes. Its manufactures include the largest chair factory in the state. The discovery and development of rich deposits of petroleum in the surrounding region has greatly stimulated the growth of the city in recent years. Population 13,348.

Marigold (*măr'i-gōld*), a name given to certain plants of the same order as the chrysanthemum and dandelion. Pot marigold is a native of France and southern Europe, with

an upright stem, one to two feet in height, with large, deep-yellow flowers. These flowers are sometimes used in flavoring soup and in coloring cheese. Some kinds are natives of America. Corn marigold is a chrysanthemum.

Marinette (*măr-i-nĕt'*), a town in Wisconsin, at the mouth of the Monominee river. It contains iron foundries, sawmills and planing mills, and its chief industry is lumbering. Population 16,195.

Mario (*mä-rē-ō*), **Giuseppe,** a famous Italian opera-singer, was born at Cagliari, Italy, in 1812, and was the son of General di Candia. After serving some years in the army, he went to Paris, where his voice and charming manners made him highly popular. His heavy debts forced him to sing for a living, and in 1838 he made his first appearance in opera as "Robert," in *Robert le Diable*, (Robert the Devil). In this he achieved the first of many successes in Paris, London, St. Petersburg, and America. He was generous and always ready to help struggling artists. Mario married the famous singer Giulia Grisi, and retired from the stage in 1867. He died Dec. 11, 1883. See Engel's *Musical Celebrities*.

Mar'ion, Francis, General, was born at Winyaw, S. C., in 1732. Marion came of a Huguenot family, had little schooling, and in 1759 served in a cavalry troop commanded by one of his six brothers in an expedition against the Cherokees. At the outbreak of the Revolutionary war, he was a member of the South Carolina congress. As captain of a company he served in a successful attack on Fort Johnson at Charleston. In 1777, with but 600 men, he vainly tried to defend Georgia from the British. In 1779, he was intrusted with the command of Fort Moultrie. During the siege of Charleston he accidentally broke his leg and was carried out of the city with the other wounded. As he grew better, he gathered his neighbors about him, and gradually built up the brigade that afterward became so famous. Colonel Marion's small and ragged regiment was rather looked down upon by General Gates, when it marched into camp. But when Gates was defeated at Camden, Marion, who had been sent to destroy the boats on the rivers, rescued the American prisoners.

Marion's brigade now began those marches, forages, and surprises, which crippled the enemy severely. His main camp was at Snow's island, hid among impassable swamps; but he also had hiding-places in almost every Carolina marsh. He cheerfully slept without a blanket and marched without a hat. It is said that a British officer, sent to ask an exchange of prisoners, was led blindfolded into the "Swamp Fox's" camp. General Marion politely invited him to dinner, and the officer was surprised to find that the meal was made up wholly of sweet potatoes roasted in the ashes and served up on a piece of bark, and a drink made of vinegar and water. The officer on going back to the army, threw up his commission, saying he could not fight against men whose patriotism went to such lengths. After the war, Marion was a member of the state senate and helped to frame a state constitution. He died near Eutaw, S. C., Feb. 28, 1795. See *Life*, by Horry and Weems; also *Life*, by Simms.

Mar'ion, Ind., a thriving city and important railroad center, the capital of Grant county, northeastern central Indiana, 66 miles northeast of Indianapolis. It is the seat of a national soldiers' home, a normal college, high schools, etc., and has many manufacturing establishments, including malleable-iron works, rolling and flour mills, glass factories, etc. In the past decade it has doubled its population, its present inhabitants numbering 17,337.

Marius (*mā'ri-us*), **Caius,** a famous Roman general, who was seven times consul, was born of an unknown family at Cereatæ, Italy, 157 B. C. He was under the younger Scipio at the siege of Numantia in 134 B. C. In 119 he was made tribune of the plebs, and became a popular leader by his vigor against the nobles. In 114, as proprætor of Spain, he cleared the country of the robbers from which it had greatly suffered. After marrying Julia, the aunt of the great Cæsar, he served in Africa during the war against Jugurtha. After a year as consul he went back to Africa, as proconsul of Numidia, and successfully finished the war against Jugurtha, in 106. But the honor of capturing the beaten king fell to Sulla, and was the beginning of his jealousy of his lieutenant, which later on caused the bloody civil war. In 104, and also in the next three years, he was chosen consul, as it was felt that Marius alone could save Rome from the hordes of Cimbri and Teutones which had burst into Gaul and slaughtered several bodies of Roman troops. The war lasted two years, but finally the Teutons were blotted out, in a two days' battle at what is now Aix, in Provence, in which from 100,000 to 200,000 were killed. When, besides this success, he had overthrown the Cimbri and Rudii, the Romans were wild with joy, called him the saviour of the state, and made him consul, for the sixth time, in 100 B. C. This was the height of his power. His jealousy of Sulla, who had been given charge of the war against Mithridates, brought on the civil war, in 88. Marius was soon forced to flee, and after hardships and hairbreadth escapes reached Africa. During his flight his hiding-place was discovered, and he was flung into prison at Minturnæ. Here, when a Cimbrian slave was sent to kill him, "Wretch, darest thou slay Caius Marius?" said the old hero as he glared on him out of the gloom of the dungeon. The slave fled in terror, saying, "I cannot kill Marius"; and the citizens, looking on it as an omen, allowed the exile to escape. When his friends rose

under Cinna, he hurried back to Italy, and the two generals marched on Rome, which was forced to yield. In revenge against the aristocracy, Marius let loose a band of 4,000 slaves, who kept up their work of murder for five days and nights. Marius and Cinna were chosen consuls in 86, but Marius had only held office seventeen days when he died. See Michelet's *Roman Republic;* Mommsen's *History of the Roman Republic;* Sewall's *Child's History of Rome;* Yonge's *Young Folks' History of Rome.*

Marjoram (*mär'jō-ram*), a class of plants of which several kinds are common, as pot and sweet herbs in gardens. The common marjoram is a native of Great Britain, and is sweet-smelling, with a bitter taste. The dry leaves are sometimes used instead of tea. The plant-tops are used as a purple dye for woolen cloth. Oil of marjoram is also distilled from the plant. Pot, knotted, and winter-sweet marjoram are other varieties.

Marjorie (*mär'jo-ry*) **Fleming,** a little Scotch girl, made immortal by the pen of the Scottish writer, Dr. John Brown, of Edinburgh. She was born at Edinburgh, Jan. 15, 1803. She was very bright and precocious, writing poetry, reading Swift, Pope, and Gray, and Newton *On the Prophecies*, and *Tom Jones*, and reciting Shakespeare by the hour. She was a great pet of Sir Walter Scott, who almost every day either visited her or carried her off, wrapped in his shepherd's plaid, to his "den," and amused himself for hours with the bright talk and learned quotations of his "Maida," as he called her. Scott says of her: "She's the most extraordinary creature I ever met with, and her repeating of Shakespeare overpowers me as nothing else does." She died Dec. 19, 1811, when only eight years old. The beautiful story of her short life is now an English classic, and can be found in the second series of *Spare Hours*, by Dr. John Brown.

Mark, called "John, whose surname was Mark," is held to be the author of the second Gospel. Of Mary, his mother, nothing is known except that her house in Jerusalem was visited by Peter and the other disciples. By some Mark is thought to be the young man mentioned in Mark XIV. 51 and 52. Mark went with Paul and Barnabas on their first missionary journey from Antioch in Syria as far as Perga in Pamphylia; here he quitted them, why, we know not; but his leaving led Paul to refuse to take him along on his second journey, and this refusal caused Barnabas to part company with Paul. Paul seems afterward to have been his friend, and refers to him as a useful fellow-worker. Of the remainder of his life we know nothing certain. He is thought to have been Peter's companion, either at Babylon or at Rome. In the art of the middle ages Mark is represented by a lion. The Gospel of Mark was written about 70 A. D., and is probably based on Peter's memory of his Master, and the scenes he had himself passed through. It is pretty certain that the evangel of Mark was the first Gospel to be written.

Mark An'tony. See ANTONY.

Mark'ham, Sir Clements R., an English naval officer, geographer and author, was born at Stillingfleet, Yorkshire, England, July 20, 1830. Sir Markham is the son of Rev. David F. Markham, vicar of Stillingfleet and canon of Windsor. He was educated at Westminster school, and entered the English navy in 1844, at the age of fourteen. He served in the Arctic expedition in search of Sir John Franklin when but twenty years old. He left the navy the next year, and spent two years in travel in Peru. As a result of these travels and studies, he introduced into India the cultivation of the cinchona tree, from which quinine is obtained. He acted as geographer of the Abyssinian expedition in 1867–8. He was created a knight in 1896, being president of the Royal Geographical society, the International congress, and of the Hakluyt society. He has published many works of great value, including *Franklin's Footsteps, Life of the Great Lord Fairfax, The Fighting Veres, History of Peru, Threshold of the Unknown Region, Memoirs of the Indian Surveys, History of Persia, History of the Abyssinian Expedition, Missions to Thibet, Lives of Columbus, John. Davis and Major Rennell, Ollanta* (a Peruvian drama, translated from the Quichua), *The Paladins of Edward the Great, Travels in Peru and India, Cuzco and Lima*, a *Quichua Grammar and Dictionary, Peruvian Bark, The War between Peru and Chile*, and he has edited many volumes of the *Hakluyt Society Transactions.* Even the long list here given contains but part of his distinguished contributions to travel, science, biography, and geographical information.

Mark Twain. See CLEMENS.

Marl, a natural mixture of clay and carbonate of lime. The proportion of lime varies from 6 to 20 per cent. Marly soils are usually very rich, and marl has been used as a fertilizer from very early times. An English law of 1225 gave every man the right to sink a marl pit on his own ground.

Marlboro (*märl'bŭr-o*), **Mass.,** a city in western Middlesex county, 15 miles east of Worcester, and 25 miles west of Boston. It is on the lines of the Fitchburg and the New York, and New Haven and Hartford railroads, and lies in a good fruit-growing region. It is largely engaged in the manufacture of boots and shoes. It has some excellent public buildings, including city hall, soldiers' monument, public library, banks, schools, and churches. Population 13,609.

Marlborough (*mawl'b'ro*), **John Churchill,** Duke of, the ablest general of his time, was

born June 24, 1650, at Ashe, in Devonshire, England. His father had been made poor by his friendship for Charles I., and young Churchill had little schooling. As captain of a company of grenadiers he was sent to help Turenne to capture the fortresses on the Dutch frontier. Here his brilliant courage and ability gained him a colonelcy. His rise was further aided by his marriage with Sarah Jennings, a woman as remarkable for her talents and strong will as for her beauty. On the accession of James II., Churchill was made a baron and general, and took a leading part in putting down the rebellion of Monmouth. On the landing of the Prince of Orange, he stole away to the side of the invader, and was rewarded for his treachery by being made Earl of Marlborough. He was of great service to William III. in conquering Ireland, and as commander against the French in the Netherlands; but was not wholly trusted by the king, and on an untrue suspicion of being concerned in a plot, was imprisoned in the Tower, and was not given any public office for five years. When Queen Anne came to the throne, in 1702, he was given command of the British army in the Netherlands, and during the war of the Spanish Succession he showed his unrivaled generalship in carrying on some of the greatest campaigns of English history. Anne showered honors and offices on both Marlborough and his wife. Marlborough, in fact, became regent in all but name. In 1702, as commander of the Dutch and English forces, he drove the French out of Spanish Guelders. In 1704, together with Prince Eugene of Savoy, he routed the French and Bavarians at Donauwörth, and on August 13th won the great victory of Blenheim. Of 56,000 men the French and Bavarians lost 40,000, and the loss of the allies was fully 12,000. This battle stamped Marlborough as the first general in Europe, and the queen and the emperor vied in honoring the conqueror. In 1706, the duke renewed that career of victory which broke the spell surrounding the great power of France under Louis XIV., who gloried in calling himself the "Invincible." On May 23, 1706, the battle of Ramilies was fought, which obliged the French to leave the whole of Spanish Flanders. But, in 1708, their attempt to recover this lost ground led to the battle of Oudenarde, fought July 11th, which resulted in an utter defeat of the French. The surrender of Lille and Ghent ended the campaign. In 1709, was fought the battle of Malplaquet, as Marlborough himself said, "a very murdering battle." The numbers were about even, but the French had the best position. The slaughter was tremendous, the casualities reaching 20,000 on the side of the allies and 8,000 on that of the French. The last campaign was in 1711, and when town after town had been taken from the French, the treaty of Utrecht gave thirty years' peace to Europe. Meanwhile the queen, tired of the tyranny of the duchess of Marlborough, who had ruled her as a child, threw off the yoke. The charge of having embezzled public money was brought against the duke, and he was stripped of all his offices till George I. came to the throne in 1714, when, in a day, he was again placed where he had stood after the battle of Blenheim. He died near Windsor, June 16, 1722. See Coxe's *Memoirs*, Saintsbury's *Life*, and Thackeray's *Henry Esmond*.

Marlitt (*mar-lēt'*), **E.** (*nom de plume* of "Eugenie John"), novelist; born at Arnstadt, Germany, Dec. 25, 1825. She began life as a public singer, but losing her voice soon after, for some years she lived as companion to the Princess of Schwarzburg-Sonderhausen, who had in earlier life assisted her. She began in 1863 the publication of those serial novels which made her famous, writing for *Die Gartenlaube*, an illustrated journal. Her best-known works are *Gold Else; Das Geheimniss der Alten Mamsell* (translated and published in English as *The Old Ma'mselle's Secret*) *Reichs-grāfin, Gisela* (Countess Gisela); *Die Zweite Frau* (The Second Wife); *Im Hause des Kommerzienrats; Im Schillingshof; Amtmanns Magd*, and *Die Frau mit den Karfunkelsteinen*. Her style was clever, popular, and eminently successful in winning a large number of readers, although her works were severely criticised by those usually accepted as authorities in literature. She died June 22, 1887.

Marlowe (*mär'-lo*), **Christopher,** the greatest English dramatist before Shakespeare, was a shoemaker's son, and was baptized at Canterbury, Feb. 26, 1563 or 1564. He studied at King's school, Canterbury, and at Cambridge. The earliest of his plays that we still have is *Tamburlaine the Great*, which was probably played in 1590. In spite of its bombast it is far ahead of any tragedy that had yet appeared on the English stage. It is in blank verse, of which Marlowe was the first to discover the strength and variety. Soon after was played *The Tragical History of Doctor Faustus*. Other playwrights have made additions to it, but parts of it show Marlowe's genius at its height, especially in the description of Helen's beauty. *Edward II.*, authorized to be played about 1593, is the ripest of his plays. It has not the fine poetry of *Faustus* and the first two acts of *The Jew of Malta*, but is better planned and more complete. *Edward II.* is fully equal to Shakespeare's *Richard III.* Charles Lamb says of it: "The death scene of Marlowe's king moves pity and terror beyond any scene, ancient or modern, with which I am acquainted." There is no doubt that Marlowe had a hand in the three parts of *Henry VI.*, and probably also in *Titus Andronicus*. His beautiful poem, *Hero and Leander*, was left unfinished. Shakespeare quoted in *As You Like It* the line, "Who ever loved that loved not at first sight?" and the watermen, too, sang

couplets from it as they sculled along the Thames. At Deptford, on June 1, 1593, at the age of twenty-nine, Marlowe met a violent death in a quarrel with a serving-man.

Marmont (*mär'mŏn'*), **Auguste Frederic Louis Viesse De,** was born at Châtillon-sur-Seine, France, July 20, 1774. He entered the army when quite young and met Napoleon at Toulon. His courage at the battles of Lodi, Castiglione, and San Giorgio earned him the rank of general of brigade in the campaign in Egypt. He commanded Napoleon's artillery at Marengo, after which he became general of division. In 1805, he defeated the Russians at Castelnuova and was made duke of Ragusa. In 1809, he won the battle of Znaim and was made a marshal. In 1811, he was given the chief command in Portugal, but a wound received in the battle of Salamanca (in which Wellington defeated him) sent him back to France. In 1813, he commanded a corps at Lützen, Bautzen, and Dresden, but in the beginning of 1814 was forced to make a truce with Barclay de Tolly, which obliged Napoleon to give up his throne. For this the Bonapartists called him a traitor. He took no further part in affairs till the Revolution of 1830, when at the head of a body of troops he tried to capture Paris, and with the few battalions that remained faithful to the royalist cause, he carried Charles X. across the frontier. He died at Venice, March 2, 1852, the last of the marshals of the first empire. His *Mémoires* have been published (1856–57).

Marmora (*mär'mo-ra*), **Sea of,** called the Propontis in early times, separates European from Asiatic Turkey and joins the Ægean sea by the Dardanelles (formerly the Hellespont) with the Black sea by the Bosphorus strait. It is in the form of an oval, 175 miles long and 50 miles broad. It covers 4,499 square miles and its greatest depth is 4,250 feet. The gulf of Ismid reaches about 30 miles eastward into Asia. There are several islands; the largest, Marmora, is famous for its quarries of marble and alabaster.

Marmoset (*mar'mō-zĕt'*), a small monkey of squirrel-like appearance inhabiting South America. The headquarters of the family is Brazil. They are the smallest of the monkey tribe, and the lowest of the Anthropoidea, the group which contains monkeys, baboons, and higher apes. They have a furry coat and a bushy tail, which is not prehensile. See MONKEY.

Mar'mot (*mär'mŏt*), a burrowing animal belonging to the group of ground squirrels. The common marmot is an European form inhabiting the Alps, Pyrenees, and other more northern mountains. The ground hogs, or woodchucks, so generally distributed in the United States and Canada, belong to the group. They are the largest and the heaviest animals of the squirrel family. They are about two feet long and covered with long coarse hair. Their ears are small, and their tails short and bushy. When numerous, wood-

ALPINE MARMOT.

chucks are a great pest, they eat nearly everything green, and are difficult to eradicate. There are three species in North America — the ground hog proper, the yellow-bellied marmot of the Rocky mountains, and the large hoary marmot further north. The prairie dogs are also marmots. See PRAIRIE DOG.

Marnix (*mär-nēks'*), **Philipp Van,** Lord of St. Aldegonde, a Dutch writer and patriot, was born at Brussels in 1538. He took an active part in the Reformation and in the rebellion of the Netherlands against Spain. A friend of William of Orange, he was appointed his representative at the first meeting of the estates of the United Provinces held at Dort in 1572. He went on special missions to the courts of England and France, and helped to bring about the union of Utrecht. In 1583, he was made burgomaster of Antwerp and defended the city for thirteen months against the Spaniards. Then he was forced to surrender, which act earned him so much ill-will that he left public life. He spent the remainder of his life in writing poems and satires. His song *Wilhelmus* (William of Nassau) is the famous hymn of Dutch liberty. Marnix died at Leyden, Dec. 15, 1598.

Maronites (*măr'ō-nīts*), one of the Christian sects of Syria, which takes its name from a monk called Maro, who lived in the 5th century, or perhaps from their first patriarch Maro. They were united with the Roman church in 1445, and in 1534 Gregory XIII. founded a college at Rome for the education of their clergy. They retain, however, their national rites and use the Syriac language in their liturgy. They number about 200,000, and are a sturdy, warlike race of mountaineers.

Maroons (*ma-rōnz'*), the name formerly applied in Jamaica and Guiana to escaped negro slaves. When the British won Jamaica from the Spaniards, in 1655, many slaves fled to the mountains. They and their descendants kept up a protracted warfare with the colonists for 140 years; but in 1795 they were conquered and part of them taken to

Nova Scotia, and afterward to Sierra Leone. The Maroons of Guiana, who are generally called bush negroes, about 4,000 altogether, form a number of independent bodies. See Dallas' *History of the Maroons*.

Marot (*mă-rō'*) **Clement,** a French poet of the time of Francis I., was born at Cahors, probably in 1496. His father was a poet and courtier, and Clement began to write verses when quite young, addressing many of them to Margaret, queen of Navarre, into whose service he had entered. He was wounded at the battle of Pavia, and imprisoned some months as a heretic. The reckless wit and satire of his poems made him enemies, and he was forced to flee from Paris. In 1538, he was back again, bringing out his translation of the Psalms, which became very popular. The Sorbonne condemned it and he fled to Geneva, and died at Turin in 1544. His gift lay in badinage and graceful satire. His poems were elegies, epistles, rondeaus, ballads, songs, sonnets, etc. His style had a good deal of influence on French writing.

Marquesas (*mär-kā'sȧs*) **Islands** are a group in Polynesia (the South Pacific) belonging to France. This group includes four or five islands discovered by Mendana in 1595, and also the Washington group of seven islands discovered by Ingraham in 1797. The Marquesas cover four hundred and eighty square miles, and are volcanic. In the time of Captain Cook, the natives numbered 100,000; by 1838 there were but 20,000, and now are only some 5,000. They are perhaps the finest race of brown Polynesians, courteous, but cruel and revengeful. The chief products of the islands are oranges and copra.

Marquette (*mär-kĕt'*), **Jacques,** a French explorer and missionary in America, was born at Laon, France, in 1637. When seventeen he became a Jesuit, and in 1666 was sent to Canada. He studied some of the Indian languages in the neighborhood of three rivers, and founded the mission at Sault Ste. Marie. He next preached among the Hurons and Ottawas, and when they were scattered by the Sioux, followed them to Mackinaw, where he built a chapel. He had heard of the Mississippi river from the Indians, and in 1673 was sent to explore it by Frontenac, the governor of Canada, together with Louis Joliet. With five other Frenchmen they left Mackinaw in two canoes May 17, and reached the Mississippi June 17, by way of Green bay, Fox river, and over a short portage to the Wisconsin. Near the mouth of the Ohio, they found Europeans, and were told by the Indians that it was not more than ten days' journey to the sea. They then went as far as an Indian village, probably near the mouth of the Arkansas, and now felt sure that they were not more than two or three days' journey from the mouth. They were also certain that the river emptied into the gulf of Mexico, and not, as had been thought, in Virginia or California, and not wishing to be captured by the Spaniards, they pointed their canoes upstream. They reached Mackinaw by way of the Illinois in September, having covered a distance of 2,500 miles. On the way back, Père Marquette had promised the Kaskaskia Indians to come and preach to them, and after a year's sickness, he set out for the country of the Kaskaskians, in October, 1764. Sickness forced him, however, to winter on the Chicago, and he did not reach the Indian village till the spring of 1765. He had hardly begun his mission when he became certain he could not live much longer, and set out to go back. He only got as far as the little river flowing into Lake Michigan, which bears his name, where he died. The story of his voyage and missionary journeys is told in Shea's *Discovery and Exploration of the Mississippi Valley*.

Marquette, a town in Marquette county, Michigan, situate 420 miles north of Chicago, on the southern shore of Lake Superior. Iron ore is mined in the region and shipped in great quantities, besides being used in its furnaces and foundries. It has also sawmills, machine shops, and a slate quarry. It is the seat of a Catholic bishopric. Population 10,058.

Marryat (*măr'i-ăt*), **Frederick,** English novelist and captain in the navy, was born in Westminster, England, July 10, 1792. In 1806, he went to sea as midshipman under the famous Captain (Lord) Cochrane. He saw some active and dangerous service off the coast of France and Spain and in the Mediterranean. His frigate was the *Impérieuse*, and he writes of her cruises in his private log that they "were times of excitement from the hour in which she hove up her anchor till she dropped it again in port; the day that passed without a shot being fired in anger was with us a blank day." He rose to be a commander when but twenty-three years old. He did good work in putting down the channel smugglers in the *Rosario*, and was sent out in command of the *Lorne* to Burma, where his men suffered badly in river and stockade fighting. He gave up the command of the twenty-eight-gun frigate, *Ariadne* in 1830, and the remainder of his life was spent as a writer. In 1837, Marryat made a tour of the United States, where he stayed two years. As a writer of sea-stories he has no superior, and, aside from Dickens, no English novelist has awakened heartier and more honest laughter. His books became immensely popular as soon as they appeared, and will always be the delight of boyhood. *Mr. Midshipman Easy*, *Jacob Faithful*, *Frank Mildmay*, *Peter Simple*, and *The Phantom Ship* are perhaps the best. Marryat died from overwork at Langham, Norfolk, Aug 9, 1848. See *Life and Letters of Captain Marryat*, by his daughter, Florence Marryat.

Mars, the early Italian god of war, and of farming. As the father of Romulus he was held to be the founder of the Roman race, and shared with Jupiter the honor of being called *Pater*. His priests danced in full armor. The wolf and the woodpecker were sacred to him. He had many temples in Rome, the most celebrated of which was the one on the Appian road, and the one to Mars the Avenger, built by Augustus in the Forum. The Campus Martius, where the Romans practiced athletic and military exercises, was named in his honor; so was the month of March. The games of Mars were celebrated every year in the circus on August 1.

Mars. See PLANETS.

Marseillaise (*mär-sē-yāz'*) **La,** the stirring song or hymn of the French republicans, was written in 1792 by Rouget de Lisle, a young officer then stationed at Strasburg. He composed both words and music one night in April, after dining with the mayor of the city. He called it a "Song of the Army of the Rhine." It was quickly carried by the revolutionists to the chief cities of France. It was brought to Paris by the volunteers of Marseilles, who sang it as they entered the city and when they marched on the Tuileries. So the Parisians called it *La Marseillaise*. Forbidden to be sung during the restoration and the second empire, it again became the national hymn on the outbreak of the Franco-Prussian war.

Marseilles (*mär-sālz'*), the third largest city of France, is situated on the Mediterranean, about 27 miles east of the mouth of the Rhône. It is the chief trade-port of France, the value of its imports and exports annually exceeding 2,250,000 francs. About 30,000 emigrants, most of whom are not French, embark at Marseilles yearly. Its harbor covers 70 acres, running into the heart of the city, and for a mile along the shore to the west are docks and warehouses. The chief industry is the making of soap, vegetable oils, and oil-cake. Soda, sugar, macaroni, iron, lead, zinc, tiles, and leather are also manufactured. There are large flour mills, wine vaults, and a good deal of fishing is done. The city is mainly built on the slopes overlooking the harbor. Its chief buildings are the cathedral, two interesting early churches, the health-office of the port, the museum, the Longchamp palace, and the public library. There is also a botanical and zoological garden, an observatory, and many special schools. Marseilles was the birthplace of Thiers. It is one of the oldest towns of France and was founded by Phoceans (Greek colonists) from Asia Minor about 600 B. C. For 900 years it was a center of Greek civilization. It sided with the Romans against its rival Carthage, and with Pompey against Cæsar, who stormed it in 49 B. C. It was held in turn by the Saracens, Charles of Anjou, Alphonso V. of Aragon, and came into the hands of Henry III. of France in 1575. In 1112, it was a republic. Louis XIV., in 1660, took away its privileges as a free-port, which it had had for centuries. In 1720 and 1721, nearly half the population of 100,000 died of the plague. Marseilles took a leading part in the French revolution, set up a commune in 1871, and was always noted for its republicanism. Its trade has grown fast since the French conquest of Algiers and the opening of the Suez canal. Population 442,239.

Marsh, George Perkins, an American philologist and diplomat, was born at Woodstock, Vermont, March 15, 1801, and died at Vallombrosa, Italy, July 24, 1882. He graduated at Dartmouth college in 1820, studied law, and was chosen to the supreme executive council of Vermont in 1835. From 1842 to 1849 he was a member of congress. While American minister to Constantinople from 1849–53, he was sent on a special mission to Greece. In 1861, he was appointed the first minister from the United States to Italy. While abroad he traveled in the east and in Europe, passing some time in Denmark, Norway, and Sweden, where he was recognized as a leading Scandinavian scholar. His lectures on English philology at Columbia college and Lowell institute in Boston, put him in the front rank of philologists. Among his books are *Lectures on the English Language*, *The Origin and History of the English Language*, *Man and Nature*, and *The Earth as Modified by Human Action*. See *Life and Letters*, by Mrs. Marsh.

Mar'shall, John, chief-justice of the United States, was born in Fauquier county, Va., Sept. 24, 1755. His law studies were interrupted by the Revolution, and he served in the army under his father, Colonel Marshall, from 1775 to 1779. In 1781, he began to practice law, and soon rose to the head of the Virginia bar. He was a member of the Virginia house of burgesses, the state legislature, and the state convention that adopted the constitution. He was sent to France with Pinckney and Gerry as envoys in 1797, and with Pinckney was ordered to leave the country when they had declined Tallyrand's request for a loan. In 1799, he was elected to congress, and in 1800 became secretary of state. He was made chief-justice of the United States in 1801, holding his position till his death, which occurred at Philadelphia, Pa., July 6, 1835. His decisions are considered authoritative on all matters of constitutional law. He wrote a *Life of Washington*. See *Life*, by Magruder, in "American Statesmen" series.

Mar'shalltown, a town in Marshall county, Ia., near the Iowa river, fifty miles northeast of Des Moines, with a large trade in grain. It has also foundries, machine shops, and manufactories of soap, flour, oil, and wire fencing. Population 11,544.

Marsh'mallow, a class of plants with showy flowers, natives of Europe and Asia. The common marshmallow grows in meadows and marshes. The whole plant is wholesome, abounding in fiber, mucilage, starch, and sugary matter, though the mucilage is chiefly in the roots. Marshmallow lozenges are very popular.

Mars'ton Moor, an historic plain, seven miles west of York, England, was the scene of a great victory of the parliamentary forces over the royalist army of King Charles I., in the English civil war, July 2, 1644. Twenty-two thousand royalists were led by Prince Rupert. The parliamentary troops were in three bodies, a Scotch army, a Yorkshire army under Fairfax, and one from the eastern counties under the Earl of Manchester, Cromwell, and Crawford, in all 15,000 foot and 9,000 horse. The battle was won in the short time between seven o'clock in the evening and nightfall, and the victory was mainly due to Cromwell's *Ironsides* scattering the troopers of Prince Rupert, who had hitherto carried everything before them. The royalists fled, leaving 4,000 men dead on the field. This victory gave the whole north to the parliament, and first brought Cromwell into notice. See S. R. Gardiner's *History of the Civil War*.

Mars'ton, Philip Bourke, one of the best-known of the younger late-day English poets, was born at London in 1850. John Marston, the poet and playwright of the reign of Queen Elizabeth, was an ancestor; while his father, Westland Marston, wrote among other dramas the highly successful play *The Patrician's Daughter*. Philip was a pretty child, and it was to him that his godmother, the author of *John Halifax*, addressed her well-known poem beginning: —

Look at me with thy large brown eyes,
Philip, my king.

Yet those handsome eyes went out into utter darkness, the result of a blow on one of them, got in a baby romp when Philip was but three years old. The blind boy began to write when he had hardly left off his nursery bibs. At his father's house he met and knew well Browning, Swinburne, Dickens, Miss Muloch, Rossetti, and many others. When of age his first book was published, *Song Tide*, sung in praise of his sweetheart. Three years later, appeared his second book, *All in All*, telling of his great grief for the death of this same betrothed. His last volume, *Wind Voices*, is considered his best. Marston's poetry has pleased readers and critics alike, and much of it will live and be remembered. Marston died Feb. 13, 1887.

Marsupials (*mär-sū'pi-als*), an order of the class Mammalia, embracing animals with a pouch or marsupium for containing the young. The pouch is a fold of skin on the ventral surface of the body. The young are born in a very rudimentary condition, and are attached to the nipples of the breasts shielded by the pouch. They are now of limited geographical range, but formerly, as shown by fossils, were in nearly all parts of the globe. All except the opossum belong to the Australian region. The opossum lives in South America and the southern part of the United States. Besides the opossums, the principal kinds of marsupials are: kangaroos, wombats, native bears, bandicoots, Tasmanian devils, and pouched dogs.

Mar'ten (*mär' tĕn*), the common name for a number of closely related animals widely known on account of their fur. They all belong to the genus *Mustela*. Besides the fur bearing the name of marten, all sables come from these animals. They are abundant in the northern portion of both the Old and New Worlds. They have long slender bodies, and short legs, and live mostly on trees. Their outer fur is long and glossy, and they have abundant soft under fur. There are two species in North America with a variety of local names. The black marten, black fox, fisher or Pekan, as it is variously called, is the largest of the group, being from two or three feet long with a tail one foot. It has no immediate relatives in the Old World. It feeds on mice, frogs, porcupines and steals frozen fish. The pine marten or American sable is about the size of a large house cat. It lives in dry spots of pine forests and also on other trees. It is similar to the pine marten of Europe. The stone marten is another common variety, with hair more inclined to grayish, and pure white on the breast. The Asiatic sable furnishes the celebrated sable, most costly of furs. "A single skin of a Russian crown sable with its natural dark bloomy black, will fetch $200. Of such, a muff and boa would be worth $2,000, but sets of inferior quality may be bought for $250." The best skins come from Yakutsk, Kamtschatka and Russian Lapland. The skins are in their best condition from November to January.

PINE MARTEN.

Mar'tha's Vine'yard, the name of an island lying off the southeast coast of Massachusetts. It is 21 miles long and 6 miles wide and forms Dukes county, Mass. It was discovered by Gosnold in 1602, and named by him; it was settled in 1642 by an English merchant, and from 1664 to 1692 belonged to New York. It has a lighthouse on the promontory of Gayhead, and is popular as a summer resort. The chief towns on the Island are Edgartown, Cottage City, Vineyard Haven, and Tisbury

Town. The island is separated from Nantucket island by the Muskeget channel.

Mar'tial, Marcus Valerius Martialis, one of the finest among the few Latin poets who did not borrow from the Greeks, and the greatest of all epigrammatists in verse, was born at Bilbilis, Spain, March 1, 38 or 41 A. D. After studying at home he went to Rome, where Piso, Seneca, and other leading men became his patrons. When Titus dedicated the Colosseum to the amusement of Rome, Martial wrote epigrams on the occasion which gained him the equestrian rank. He flattered the emperor Domitian, became popular as a diner-out, divided his day between the baths, theatres, and writing epigrams, had the leading senators as his friends, and all Romans who read anything at all as his readers. But he was always in want of money, could only get a new toga or mantle by asking some patron for it, and sometimes to escape duns was forced to retire to a country place probably given him by Seneca, and which he called his "foot of earth." After thirty-four years of Rome, the younger Pliny lent him money enough to go back to Spain, for which he was homesick. Here at Bilbilis a new patron gave him an estate on which, with its grove, its fountain, its vineyard, its garden, its fishpond, and its dovecote, he spent the rest of his life comfortably. Writing with the greatest ease and quickness, his epigrams show also a fine finish. As an epigrammatist he remains without an equal. He lifts the veil from the Rome of the time of Domitian and shows it mainly on its seamy side, with a likeness to life not outdone by the engravings of Hogarth. Martial died in Spain, in 104 A. D.

Mar'tin, the common name for certain large swallows found in Europe and America. The North American form is often called the purple Martin, on account of the color of its upper parts. Like other swallows, it has long wings and a deeply forked tail. It nests near houses, and where boxes are placed for it will occupy the same shelter year after year. The number of injurious insects destroyed by these birds is enormous — in the height of their activity, probably several hundred every day for each bird. The European house Martin is similar in habits.

Mar'tin, John, an English painter, was born at Haydon Bridge, Northumberland, July 19, 1789. He went to London in 1806, and after a hard struggle for a living became known by means of his picture, *Sadak in Search of the Waters of Oblivion.* His works were quite popular and were highly praised by Bulwer-Lytton. Among them are the *Fall of Nineveh. Belshazzar's Feast, The Last Man,* and *The Eve of the Deluge.* Martin died in the Isle of Man, Feb. 17, 1854.

Martin, Saint, bishop of Tours, was born at Sabaria, in the Roman province of Pannonia, about 316 A. D. His father, who was a military tribune, wished him to enter the army, which he did, serving first under Constantine and then under Julian the Apostate. Many stories are told of his upright life while a soldier — a remarkable thing in those days. Deciding to give his life to the church, he left the army, converted his mother to Christianity, and suffered much persecution from the Arian party in the church. About 360, he founded a monastery near Poitiers, but eleven years later was dragged by force from this retreat and made bishop of Tours. The fame of his saintliness and his reputation as a worker of miracles drew crowds of pilgrims from all parts of Gaul. Martin was the first in the Roman church who was given the title of "confessor" rather than martyr. He died between 397 and 401. His birthday is celebrated on November 11, and in Scotland this day still marks the beginning of winter and is called "Martinmas." St. Martin's day used to be begun with feasting and drinking, and so St. Martin came to be the patron of drinking and reformed drunkards. See Cazenove's *St. Hilary and St Martin.*

Martineau (*mär'-tĭ-nō*), **Harriet,** was born at Norwich, England, June 12, 1802. Her father was a manufacturer and gave her a good education. Before she was twenty, she began to write for the magazines, and in 1829 the failure of the firm in which she and her mother and sisters had placed their money obliged her to earn her own living. A series of stories, *Illustrations of Political Economy,* which she brought out in 1832, in spite of many discouragements and refusals from publishers, at once made her widely known. Five thousand copies of the first number were sold in two weeks, and from that day the way was open to her for life, and she never again had any want of employment or of money. In 1834, she came to America for two years and soon after published *Society in America.* As a girl she had been often unhappy and anxious because of ill-health, and now, from 1839 to 1844, she was again an invalid. Among her books are four volumes of children's tales: *Forest and Game-Law Tales; Letters on the Laws of Man's Social Nature and Development; Deerbrook,* a novel; *Biographical Sketches,* etc. One of her most important works was the careful translation of Comté's *Positive Philosophy.* Miss Martineau was a vigorous thinker, seeing clearly and saying clearly what she had to say. Her sympathy and kindness of heart won esteem for her, even of those who did not share her opinions, and few women writers have in their time enjoyed more fame than she did. She died in Westmoreland, June 27, 1876. See her *Autobiography.*

Martineau (*mär'tĭ-nō*), **James,** an Englishman, a Unitarian minister, and an author of note, was born at Norwich, England, April 21, 1825. His sister, Harriet Martineau, was

equally well known by reason of her own contributions to the press which were of a somewhat more radical character than those of the brother. Martineau was of a Huguenot family, settled in England, his father being a prosperous business man in the place of his birth. He was educated at private schools, the universities of England not being open at that time to dissenters. He was ordained by the synod of Munster, Ireland, in 1828, and began his work as assistant pastor of the Eustace Street Presbyterian church, Dublin, shortly after. The Irish Presbyterian church of that day, however, differed in doctrinal teaching from other denominations by the same name. Dr. Martineau gradually moved farther and farther from the standards of the synod, but claimed to the last to be a Presbyterian minister. He was soon appointed professor of philosophy in Manchester New college, and later principal of the same, serving in this institution from 1840 to 1886. He followed the college when it was moved to London in 1857. He received the degree of LL. D. from Harvard in 1872; that of D. T. from Leyden in 1875; that of D.D. from Edinburgh, in 1884; D. C. L. from Oxford in 1888; and D. C. L. from Dublin in 1892. He was a voluminous writer, chiefly upon philosophical and religious themes, his best-known works being *The Rationale of Religious Inquiry; Endeavors after the Christian Life; Types of Ethical Theory, A Study of Religion*, and *The Relations between Ethics and Religion*. Besides his separate volumes, he published in 1890–91 four volumes of essays and reviews collected from various periodicals. He died at London, Jan. 11, 1900.

Martinique (*mär-tĭ-nēk'*) is one of the Lesser Antilles in the West Indies. It is 43 miles long, from 12 to 20 broad, and covers 380 square miles. The island was discovered by the Spaniards in 1493, was settled by the French in 1635, and except for three short intervals, when it was held by the British, it has since 1635 been a French colony. A high, thickly-wooded ridge runs from north to south. The coast is high and indented, except on the west, where is the main trading town, St. Pierre (population 26,000), and the capital, Fort-de-France (population 17,275), which was nearly ruined by fire in 1890. Half the land tilled is given to sugar cane; the other chief crops are manioc, sweet potatoes, and bananas. The principal exports are sugar, molasses, and rum. In 1899, the value of the exports of the island amounted to 26,600,000 francs. Population 187,690, but only 12,000 are whites.

Martius (*mart'se-ŏs*), **Karl Friedrich Philipp von,** Bavarian traveler and naturalist, was born April 17, 1794, at Erlangen, Germany. He studied medicine, and spent three years in Brazil as a member of a scientific expedition sent out by the Austrian and Bavarian governments. His researches on this expedition gained him a reputation second only to that of Humboldt. These researches were published after he reached home — one book on the journey, and several on the cryptogams, palms, and other plants of Brazil, on the medicine of the Indians, and on the races and languages of that region. For thirty-eight years he was professor of botany at Munich. Martius died at Munich, Dec. 13, 1868.

Mar'tyn, Henry, a missionary martyr, was born at Truro, England, Feb. 18, 1781, and studied at Cambridge university. Here he took high honors and at first wished to study law, but becoming fired with missionary enthusiasm, he sailed in 1805 for India as a chaplain of the East India company. At Serampore, Dinapore, and Cawnpore, in spite of broken health, he eagerly mastered the native language, then translated the whole New Testament into Hindustani and Persian, as well as the prayer book into Hindustani, and the Psalms into Persian; and next his zeal rising as the sands of his time ran swiftly out, sailed to Bushire, then traveled to Shiraz, Tabriz, Erivan, Kars, Erzerum, and Tokat, in Armenia, where he sank, worn out by fever, Oct. 16, 1812. See his *Life* by Sargent, and also by Wilberforce.

Marx, Karl, German socialist, was born at Trèves, Prussia, May 5, 1818. It was at first intended that he should be a lawyer, like his father, but at the universities at Bonn and Berlin he gave most of his time to the study of history and philosophy. In 1842, he became editor of a democratic newspaper, the *Rhenish Gazette*. After writing for some time for this journal, he felt that his knowledge of economic subjects needed enlarging, and so in 1843 went to Paris, then the headquarters of socialism. He soon began the course of writing and labor for the advancement of socialism which made up the work of his life. Driven out from France in 1845, he settled in Brussels, where he wrote his attack on Proudhon's philosophy. His chief work at Brussels was the reorganizing of the communistic league, for which he wrote the famous *Manifesto*. Marx took an active part in the revolution of 1848, and after its failure settled in London. In 1859, he published his *Criticism of Political Economy*, which showed a remarkable knowledge of the economic growth of modern Europe. He again became an active worker among socialists and was foremost in founding the International society. After the death of Lassalle he had the practical control of the social democratic movement in Germany. His greatest book, *Capital*, came out in 1867. This book, as also his other works, shows him to have been a man of wonderful knowledge, which he handled with masterly skill, and much more than any other man has he influenced the labor movement throughout the world. Marx died at London, March 14, 1883.

Mary, "the mother of Jesus," is held in high honor by all Christians. Of her life but little is known. It is implied in Matthew that she was of the same family as her husband, Joseph, and so, like him, a descendant of David. She is mentioned but a few times in the New Testament, and almost always with reference to her relations to Christ, as in Matthew i., ii., xii.; Luke i., ii.; John ii., xix., and Acts i., where the last notice of her is of her "persevering in prayer" with the disciples and the holy women at Jerusalem after Christ's ascension. A letter speaks of her as having lived with John at Ephesus, where she died and was buried. Another letter tells that she died and was buried at Jerusalem, at the foot of the Mount of Olives. The story is also told of the apostles coming to her tomb on the third day after her burial, and finding the tomb empty, but breathing out an "exceeding sweet fragrance." In art she is usually indicated by the term "The Madonna"; in ecclesiastical phrase as "Mary the Virgin." The date of her death is commonly fixed at 63 or 48 A. D.

Mary I., queen of England, daughter of Henry VIII. and his first wife, Catharine of Aragon, was born at Greenwich Palace, Feb. 18, 1516. She is usually known as Mary Tudor, and by ultra-Protestants as "Bloody Mary." When a girl she was a great favorite with her father, and when only seven years old was betrothed to the emperor Charles V., and was devoted to her mother and her church. When her mother was divorced, Henry treated her harshly, and during her half-brother Edward's reign she lived in retirement, and no threats could make her conform to the new English church. On the death of Edward, July 6, 1553, Mary became entitled to the crown by her father's will and the settlement made in parliament. The duke of Northumberland had, however, got Edward to set aside Henry's will in favor of Lady Jane Grey, to whom the duke had married his son, Guilford Dudley. Lady Jane was declared queen on July 10, but the whole country favored Mary, who was able without bloodshed to enter London in triumph, August 3. The queen now showed remarkable leniency toward her enemies. Northumberland and two others were put to death; but Lady Jane and her husband were spared. She sought very gradually and carefully to bring back the old religion. A few leading reformers were imprisoned, but there persecution stopped. Queen Mary's reign was ruined by her marriage to Philip II. of Spain. On this her heart was set, even in face of the fears and protests of all England. The proposal caused Wyatt's rebellion and an attack on London. This rising was put down mainly through the courage and coolness of the queen, and at once Jane Grey, who seems to have been held as a sort of hostage for her friends' good-behavior, was, with her husband and father, beheaded. Philip landed and was married to Mary. Cardinal Pole entered England as the pope's legate, and the country became once more Roman Catholic. Then began the persecution which earned the queen the name of "Bloody Mary," when some three hundred victims were burnt at the stake. During this time Mary was almost helpless with ill-health. Philip had left England in 1555, to come back once more only for a few weeks, and grief at her husband's heartlessness helped on her sickness. Finally, Philip brought her to declare war on France, and Calais, the last English foothold on French ground, was lost. Mary died Nov. 17, 1558. See the histories of Froude and Lingard; and *England under the Reigns of Edward VI. and Mary*, by Patrick Fraser Tytler.

Mary II., queen of England. See WILLIAM III.

Mary Mag'dalene, probably so named from Magdala, a town of Galilee, a woman mentioned in Luke VIII. 2, as "Mary Magdalene, out of whom went seven devils," among those that accompanied Jesus. She is held to be the same as the woman "which was a sinner" who, as Jesus sat at meat in the house of Simon the Pharisee, washed his feet with her tears and wiped them with the hairs of her head, and anointed them. She is thought by some to be the same as Mary, the sister of Martha and Lazarus, for which there is little ground. Mary Magdalene stood by Jesus on the cross, and was present when he was laid in the sepulchre. On the first day of the week she came early to the tomb and finding it open ran and told Peter and John that they had "taken away the Lord out of the sepulchre." The three approach and see the two angels, "one at the head and the other at the feet where the body of Jesus had lain." Just after, Christ appears to her and announces His coming ascension. The story that she passed her last days in the desert in penitence for her sinful life has been made the subject of paintings by Guido, Correggio, Canova, and other great masters.

Mary Queen of Scots ("Mary Stuart") was the daughter of James V. of Scotland and Mary of Lorraine, daughter of the French Duke of Guise. She was born at Linlithgow, Scotland, Dec. 8, 1542. Her misfortunes may be said to have begun with her birth. The news reached her father on his deathbed. "The devil go with it!" he muttered, as he thought of the marriage with the daughter of Bruce, which brought the crown to the Stuarts—"it cam with ane lass and it will pass with ane lass." Mary, on the death of her father, James V., became a queen before she was a week old, and was crowned at Stirling Castle, Sept. 9, 1543. Within a year the regent Arran had promised her in marriage to Prince Edward of England, and the Scotch parliament had declared the promise null. A war with England followed, and the Scots were badly defeated at Pinkie Cleuch. But hating

an English match more than ever the young queen was offered and accepted in marriage

MARY QUEEN OF SCOTS.

to the eldest son of Henry II. of France. A French fleet carried the six-year-old girl to France where she was betrothed to the dauphin. Her next ten years were passed at the French court, where she was taught with the king's children. At the age of sixteen she was married to the dauphin Francis, who was six weeks younger than herself. In 1559, Francis came to the throne and for a year and a half Mary was queen of France. When the feeble and sickly Francis died, Mary cared little to stay at a court now ruled by the queen-mother, Catharine de Medici, whom she had taunted with being a "merchant's daughter"; and her presence was needed, too, in Scotland, for her mother had just died and the country was without a government and torn by the struggle of the Reformation. Mary landed at Leith in 1561, after escaping the English ships which Elizabeth had sent to capture her. The Reformation claimed to have been sanctioned by the Scottish parliament and the new queen was content to leave affairs as she found them, only claiming the liberty to use her own religion. Many schemes for Mary's marriage were brought forward. The kings of France, Denmark, and Sweden, the Archduke Charles of Austria, Don Carlos of Spain, the dukes Ferrara, Nemours, Anjou, Arran, and Leicester, were proposed as suitors. Mary herself preferred Don Carlos, the heir of the greatest kingdom in Christendom, but when all hope of getting him was quenched, she suddenly, in 1565, married her cousin, James Stuart, Lord Darnley. Darnley was a great-grandson of Henry VII. of England, and was thus among the nearest heirs of the English crown; but though good-looking, he was weak and vicious, his house had few friends and many enemies in the country, and he was a Catholic. This marriage caused the earl of Moray, the queen's natural brother and her chief minister, to head a Protestant rising; but the revolt was quelled by Mary taking the field in person and driving the rebels beyond the Tweed.

Mary soon became disgusted at Darnley's worthlessness and alarmed at his ambition. He had been given the title of king, and now claimed that the crown should be secured to him for life, and to his heirs, if the queen should die childless; and what Mary refused as a favor he prepared to take by force. Mary's chief minister since Moray's rebellion had been David Rizzio, a common-looking Italian, of brains and accomplishments, but generally hated as a low-born foreigner and a court favorite. The king and Rizzio had been sworn friends, sharing the same table and even sleeping in the same bed; but the king was now persuaded that it was Rizzio that stood between him and the crown. So a conspiracy was formed by the king and Moray and other Protestant leaders, they binding themselves to secure the crown to him and his heirs, and he agreeing to get them pardoned for their late rebellion. The result of this conspiracy was the murder of Rizzio, March 9, 1566, Darnley leading the way into the queen's cabinet and holding her in his grasp while the murderers dragged the poor Italian into an ante-chamber and mangled his body with over fifty wounds. When Mary heard what had been done she broke into loud upbraiding of the king. "I shall be your wife no longer," she told him. But when Darnley on his own authority dismissed the parliament which was about to bring Moray and the other defeated rebels to trial, Mary realized the purpose of the conspirators and set to work to defeat them. By her blandishments she succeeded in detaching Darnley from the others, persuaded him to escape with her from their power by a midnight flight, and to make proclamation denying all connection with their designs. This ended the conspiracy and the king was hated by both sides, as he had betrayed both. In January, 1567, he was taken sick with the smallpox, at Glasgow. Mary went to him and brought him to Edinburgh, where he was lodged in a small mansion. There Mary visited him daily and slept for two nights in a room below his bedchamber. Sunday evening, Feb. 9, she passed by his bedside, talking kindly and cheerfully with him. She left him between 10 and 11 o'clock, and about two o'clock in the morning the house in which the king slept was blown up by gunpowder, and his lifeless body found in the neighboring garden. The chief murderer was undoubtedly the earl of Bothwell, who had enjoyed a large share of the queen's favor since Moray's revolt. But the queen was also suspected, for within three months of Darnley's murder, Bothwell was acquitted at a mock trial, was divorced from his wife of only a year, was made duke of Orkney, and married the queen.

This fatal step at once arrayed the nobles in arms against Mary. Her army melted away without striking a blow and she was forced to give up the throne to her son, James VI., who was crowned July 29, 1567.

The next year, escaping from prison, she found herself in a few days at the head of an army of 6,000 men, only to be defeated at Langside, near Glasgow (May 13, 1568), by the regent Murray. Four days later, Mary crossed the Scottish borders and threw herself on the protection of Queen Elizabeth, only to find herself a prisoner for life. Mary, as the great-granddaughter of Henry VII., claimed the right of succession to the English throne. A good part of England was still Catholic and looked to Mary to restore the old faith. Of the many plots formed for her deliverance, the most famous was the one of Antony Babington, which included the assassination of Elizabeth. It was discovered; certain letters of Mary, approving the death of the English queen, came into the hands of the ministers, and Mary was brought to trial in September, 1586. She was sentenced to death in October, but Elizabeth could not find courage to sign the death-warrant till February, 1587. On the 8th, at Fotheringay Castle, in Northamptonshire, Mary laid her head on the block with the dignity of a queen and the courage of a martyr.

Mary's beauty and accomplishments are world-famous. She was admitted by everyone to be the most charming princess of her time. She was queenly in appearance, on the throne, in the dance, or on horseback at the head of her army. The charm of her soft, sweet voice is said to have been irresistible; and she sang well, accompanying herself on the harp or lute. Her manner was sprightly, affable, kindly, and frank. Her rather large features were lighted up by a winning vivacity and a high, joyous spirit. The starlike brightness of her eyes — whether hazel or dark gray we know not — her fresh, clear complexion and hair of ruddy yellow changing with her years to auburn, then to dark brown, turning gray long before its time, added their share to the beauty that bewitched French, English, and Scotch alike. Two women only, Cleopatra and Helen of Troy, share with Mary Queen of Scots the power wielded over the imaginations of men of all times and countries. See G. Chalmers' *Life of Mary Queen of Scots*, and Miss Strickland's *Lives of the Queens of Scotland.*

Maryland (*măr'i-land*), one of the thirteen original states of the Union, covers a land surface approximately of 9,860 square miles — about the size of Holland. Its greatest breadth from north to south is 120 miles, and its greatest length from east to west is 196 miles. "Mason and Dixon's Line" bounds it on the north and east. The eastern shore of Maryland is the part east of the Chesapeake bay. The western shore reaches from the Chesapeake to the state boundary, the Potomac river. The northwest part of the state is rugged and mountainous; the Blue Ridge and other Allegheny ranges cross it from Virginia and West Virginia into Pennsylvania. The center of the state is hilly, and the east and southeast low. A line drawn from the mouth of the Susquehanna to the city of Washington will divide the high and low lands of the state into nearly equal parts. The main rivers are the Potomac, Patuxent, Severn, Patapsco, Susquehanna, and Choptank. Marl, fine brick clay, gneiss, granite, limestone, iron, and large veins of the finest soft coal are found. Zinc and copper are also mined. Many kinds of marble are quarried, some of them very fine and equal to Italian marbles; the marble used in building the White House came from Maryland. Except on the mountains in the west and in the marshes along the eastern coast, the soil is fertile. Pine, chestnut, and oak are the main trees, though there are still left in the woods, hickory and walnut. The peach orchards cover thousands of acres, and canning fruit is a leading industry; Maryland canned peaches are exported to all parts of the world. The main crop in the peninsula between the Chesapeake and the Potomac is tobacco. Maryland ranks as the seventh state in the growth of tobacco, and at one time the crop of Prince George county was the largest in the Union. Corn, wheat, oats, potatoes, hay, and fruits are the other leading crops. Chesapeake bay abounds in fish, and Maryland bass, moccasin, white perch, sheepshead, herring, and mackerel are excellent. The oyster beds are of great value, and cover large areas in the ocean inlets. Canvasback ducks and other game birds are hunted on the shores of the bay, and here terrapin are found in perfection. The manufactures of Maryland exceed $100,000,000 yearly. Iron and steel, shipbuilding, machinery, pig iron, tobacco and cigars, straw hats, millinery, and cotton duck are some of the leading manufactures. There is now considerable production of fruit brandy and distilled spirits; in Allegany county there is also much coal mined. The famous National road was built early in the century for a highway between Baltimore and Ohio. The pioneer Baltimore and Ohio railroad was organized in 1827. The first American telegraph line was built from Baltimore to Washington in 1844. There are two canals in the state — from Cumberland in the west to Washington, 184½ miles, and between Chesapeake and Delaware bays, 12½ miles.

Maryland has a good school system, and a number of colleges, among them Washington college, to which George Washington gave $500, and Johns Hopkins university, one of the foremost in the country. The other institutions for higher education in the state include Western Maryland college; St. John's college, Annapolis; Loyola and Morgan colleges, Baltimore; New Windsor (Presbyterian) college: and Rock Hill and St. Charles (Roman Catholic) colleges. Maryland sends six representatives to congress. Its general assembly is made up of two houses — the senate

and the house of delegates. The capital is Annapolis (population 8,402), the seat of the United States Naval academy.

Cecil Calvert — Lord Baltimore — received a grant of Maryland, together with parts of Delaware and Pennsylvania, from Charles I. in 1632. He named his new possession in honor of Henrietta Maria, queen of England. Leonard Calvert led the first party of emigrants, made up of English gentlemen, their retainers and servants, which landed on the banks of a branch of the Potomac in March, 1634. The Indians were paid for their land, and were never very troublesome to the colonists. Calvert was himself a Catholic, but people of all beliefs were allowed to worship without persecution. During the civil war in England an engagement was fought at Providence, Md., in 1655, between sympathizers of the two English parties, in which fifty were killed or wounded. This was the first land battle between English-speaking men in America. Maryland was one of the first colonies actively to engage in the Revolutionary war. In the Civil war, Maryland, though a slave-holding state, did not secede. Its chief city is Baltimore (population 508,957), which see. Population 1,190,050.

Masaccio (*mä-sät'chō*), a Florentine painter, whose real name was "Tommaso Guidi," was born in Tuscany in 1401 or 1402, probably at Castel San Giovanni, in the valley of the Arno, Italy. Masaccio means "Slovenly Tommy," a nickname given him because of his ungainliness and careless habits. While still a young man he seems to have painted a fresco of the *Crucifixion* and scenes in the lives of the saints, in the Church of St. Clement at Florence. But his greatest achievements are on the walls of the Carmine (Brancacci) Chapel. Masolino worked at the same walls before him and Filippino Lippi after him, and it is not certain exactly which pictures were from Masaccio's brush. Those which seem his without doubt are *Expulsion from Paradise* — greatly admired by Raphael, *Peter and the Tribute Money*, *Temptation of Adam and Eve*, *Peter Preaching*, and also *Baptising*, *Healing the Sick*, *Giving Alms*, and *Restoring the Young Man to Life*. These famous pictures marked an advance in Italian art and greatly influenced later painters. Masaccio left Florence in 1428, and is said to have gone to Rome and there died in 1429.

Masaniello (*mä-sä-nē-ĕl'lo*), rightly "Tommaso Aniello," a fisherman of Amalfi, Italy, was born about 1622, and became a Neapolitan insurrectionist and the leader of the revolt which took place in Naples in July, 1647, against the Spanish viceroy, the duke of Arcos. The people had already been maddened by oppression and were now greatly excited over a new tax on fruit. A quarrel between the fruit-sellers and the hated tax-collectors drew a crowd into which Masaniello, who was a favorite of the people, ran shouting: "No taxes, no taxes! Long live the king of Spain! Down with the bad government!" Made their chief on the spot, he led them through the streets, tearing down the tax-gatherers' houses, burning palaces, opening prisons, and driving the viceroy into his castle. A government was set up by the citizens, and Masaniello was made captain-general of the Neapolitan people. An attempt of some nobles to kill him only lost them their own lives; the viceroy was obliged to remove the fruit-tax, and to give back to the citizens the privileges bestowed on them by Charles V., and the people were allowed to keep their arms till this agreement should be ratified by the king of Spain. The rising brought to a successful end, the hero of the hour threw off his rich robes and declared himself a fisherman again. But the people would not let him resign. The next day he was a different man; either success or poison had turned his head, and the freedom he had fought for soon gave place to a reign of terror. The people fell away from him, and the viceroy's agents had no trouble to assassinate him at Naples, July 16, 1647. His reign lasted just nine days. Auber's opera *Masaniello* is based on the story.

Mascart (*măs-kär'*), **Eleuthere Elie N.**, an eminent French physicist, born Feb. 20, 1837. Entered the normal school at Paris in 1858, received his doctor's degree in 1864. In 1872, he was appointed professor of physics in the Collège du France. In 1878, he was placed in charge of the meteorological bureau of France. He was elected to the Academy of Sciences in 1884. His principal work is along the line of atmospheric electricity, optics, and terrestrial magnetism. As a writer of treatises on these subjects he has rendered important service to science.

Mashonaland (*ma-shō'-na-lănd'*), Africa, is the region northeast of Matabelaland. It includes the plain — 4,000 to 4,600 feet high — whose backbone is formed by the Umvukwe mountains. It is said to be the healthiest part of South Africa, with rich soil, grass all the year round, and many running streams. The Matabele have driven the Mashona to the mountains, where they have built their villages on almost inaccessible crags. A peaceful and industrious people, of the Bantu race, they live in the greatest fear of their fierce neighbors. They raise rice, Kaffir corn, Indian corn, groundnuts, sweet potatoes, tobacco, and cotton, which they weave into blankets. Iron, copper, and gold are found in large quantities. Mauch, a German traveler, discovered many old mines which at one time had been skillfully worked, especially at a place called Zimbabwe, which he thought the same as the Ophir of the Bible. Mashonaland became a British protectorate in 1888. With Matebelaland, Mashonaland has since then been organized by the British South

African company, under the Hon. Cecil Rhodes, and is now named Southern Rhodesia. The capital is Salisbury (population about 2,000), which is now reached by a railway line from Bulawayo, thence south to the Cape. See Montagu Kerr's *The Far Interior*, *The Ruined Cities of Mashonaland*, by Bent; *Rhodesia of To-Day*, by Knight, and *How We Made Rhodesia*, by Lenard.

Ma'son and Dix'on's Line, often thought to be a line dividing the slaveholding states from the free states. In fact, it ran for over one-third of its length between two slave states, Maryland and Delaware. It was run by two English surveyors, Charles Mason and Jeremiah Dixon, during the years 1764 and 1767, and determines the boundary between Maryland and Pennsylvania, and between Maryland and Delaware. Milestones were set up, and each five miles marked by a larger stone, on which were cut the arms of William Penn and Lord Baltimore. The work was so well done that when, in 1849, it was gone over again no mistake of any account was found. The line does roughly divide the north from the south, and is popularly used to distinguish the two sections of the country.

Ma'son, George, was born at Doeg's Neck, Va., in 1725. In 1775, the Virginia convention made him a member of the committee of safety which was charged with the government of the colony. The next year he drew up a declaration of rights and a constitution for the new state, which were both adopted without an opposing vote. He also, with the help of Jefferson, had a bill passed making all kinds of worship lawful in Virginia. In 1777, he became a member of the Continental congress. In 1787, he was one of the foremost men in the convention which drew up the constitution of the United States, where he took firm ground against making slavery permanent in the country. He was afraid that the constitution, as at last agreed upon by the convention, would bring about a monarchy or a tyranny of aristocrats, and stood shoulder to shoulder with Patrick Henry in fighting its ratification by Virginia. He sought to have about twenty changes made, some of which were afterward adopted by congress. He was chosen as Virginia's first United States senator, but refused to serve. His statue stands with Jefferson's, Henry's, and those of other leading Virginians at the base of Crawford's statue of Washington in front of the capitol at Richmond. Mason died in Fairfax county, Va., in 1792.

Ma'son, James Murray, an American jurist and statesman, and also commissioner from the Confederate States to England in 1861, was born in Fairfax county, Va., Nov. 3, 1798, being a grandson of George Mason, an intimate friend and a near neighbor of Washington. He graduated from William and Mary college in his young manhood, and was admitted to the Virginia bar when twenty-two years of age. He served many years in the Virginia house of delegates and in the Federal congress from 1837 to 1839. He was elected senator from Virginia in 1847, and retained that place until the breaking out of the Civil war, when he withdrew from the senate and cast in his lot with the seceding states. He was captured Nov. 8, 1861, when on his way to Europe to represent the Confederacy abroad, and was held a prisoner by the Federal authorities until Jan. 1, 1862, when, upon the demand of the English government, he was released. His mission to England, after all, proved ineffective, although it came near embroiling the two nations, England and the United States, in war. Mr. Mason died near Alexandria, Va., April 28, 1871.

JAMES M. MASON.

Ma'son, Jeremiah, was born at Lebanon, Conn., April 27, 1768. He graduated at Yale in 1788, and studied law. He then went to New Hampshire, where he became the state's attorney-general and the acknowledged head of the New Hampshire bar. In 1813, he was chosen United States senator, and took a leading part in the debates on the embargo, conscription bill, and other questions of the War of 1812. He moved to Boston in 1832, where he practiced law till his retirement in 1838. As a lawyer he ranked with such men as Judge Story and Daniel Webster. He died at Boston, Oct. 14, 1848. See his *Life*, by Ellis.

Ma'son, Lowell, an American composer, was born at Medfield, Mass., Jan. 8, 1792. As a boy he was very fond of music, and began to teach it when quite young. In 1821, his *Boston Handel and Haydn Collection of Church Music* was published, and at once made him noted, and enabled him to leave Savannah, where he had taught for fifteen years, and make Boston his headquarters. Here he taught children's classes without charge, and published a number of music books for children, as well as glee books, and over twenty books of sacred and church music. A large part of the best American church music is Mason's. He died at Orange, N. J., Aug. 11, 1872.

Mass is the name which has been given to the amount of matter in a body. The mass of a body, the amount of matter in a body, and the inertia of a body, are strictly synonymous terms as used in modern physics.

Matter, and therefore mass, has not been defined in terms of anything simpler; but mass can be measured in terms of many other quantities. Thus mass is equal to the product of volume by density. In like manner, the mass of a body is equal to the quotient of its weight divided by the acceleration of gravity. A sharp distinction between *mass* and *weight* is essential to all clear thinking on this subject.

The standard of mass used in ordinary commerce is the mass of a piece of metal kept in the Standard's Office in London and known as the Avoirdupois Pound. The standard of mass employed in science is a piece of metal kept at the International Bureau of Weights and Measures at Sèvres, and known as the kilogramme. See INERTIA.

Massachusetts (*mas'a-chū'sĕts*), one of the New England states, and one of the original thirteen states. It is 47½ miles wide and 182 miles long, being but one-sixth as large as New York, and lies between the Atlantic ocean and New York state. The Green mountains of Vermont extend into the state in the western part in two ranges, with no very high peaks, Greylock, 3,505 feet high, being the highest; and the coast is lined with highlands. The valleys of the Housatonic and Connecticut rivers are fertile, but the higher parts of the state and the long sandy coasts are poor soil. The rivers, such as the Merrimac, Connecticut, Housatonic, and Concord, are useful mainly as furnishing water-power for the numerous factories of the state. Cape Cod is a sandy point, 65 miles long, shaped like a bent arm, inclosing Cape Cod bay, and making, with Cape Ann, Massachusetts bay, on the Atlantic coast. Martha's Vineyard and Nantucket are large islands off the coast. The scenery of the western part of the state, especially of Berkshire county, is very beautiful, and it is sometimes called the "Switzerland of America." Granite, sandstone, limestone, and hematite are the chief mineral productions of the state, but its agriculture is not equal to supplying the demands of its people, as it is the least agricultural state in the Union, only nine per cent. of its laborers being employed on farms. Its great source of wealth is its manufactures. Wire drawing was begun in the colony in 1666, and the manufacture of iron and steel wire is still a very large industry. The oldest watch factory in the United States, and the largest in the world, is at Waltham. The many shoe factories in Lynn, the great cotton mills in Lowell, Lawrence, Fall River, and New Bedford, are well known.

Shovels, belting, clothing, silverware, books, woolen and silk goods, chocolate and confectionery, carpets, furniture, carriages, and paper, are a few of the many useful articles produced in Massachusetts. The fisheries of Massachusetts are very valuable, and the shipping trade of Boston is next to that of New York. Massachusetts was one of the first states to build railroads. The Hoosac tunnel, one of the first long tunnels, cut for five miles through the Hoosac mountain, costing $16,000,000, and taking 20 years to build, was undertaken by the state. The school system is one of the finest in the country, and such institutions as Harvard university, with its 14,000 graduates; Boston university, with schools of art, music, agriculture, law, theology, and medicine; Clark university, at Worcester, for the higher special work of college graduates; Massachusetts Institute of Technology; the State Agricultural college at Amherst, Andover Theological seminary, Newton Theological institute; Amherst, Williams, Tufts, and the Catholic Boston college, are some of the best-known institutions. Radcliffe college for women was founded in 1879, Wellesley college, near Boston, and Smith college at Northampton, and Mt. Holyoke seminary and college, the earliest school of the kind for women in America, are among the ample provisions made for the higher education of women. Music and art are recognized in the New England Conservatory of Music at Boston, Art Tile works at Chelsea, Boston Museum of Fine Arts, and many art schools. There are over 500 public libraries in the state, the largest being in Boston, Worcester, Cambridge, Springfield, etc., besides the large libraries of the colleges and the Boston Athenæum.

The earliest discovery of the land embraced in Massachusetts is thought to have been made by the Norsemen, about the year 1000, and later, in 1497, the Cabots reached its coast. But the landing of the Pilgrim fathers at Plymouth, Dec. 22, 1620, is the date of the first settlement. The stone on which they landed is carefully guarded at Plymouth. Other settlements were made later, forming the Massachusetts Bay Colony. The colonists endured great privations, and suffered terribly in the Indian wars. The government, at first, was in the hands of the colonies, and was carried on with Puritan vigor; but in 1692, the country was ruled by a governor appointed by the king. The first battles of the Revolutionary war were fought on the soil of Massachusetts, at Lexington and Bunker Hill, and the troops of Massachusetts were among the earliest on the field in the Civil war. Population 2,805,346. See *History of Massachusetts*, by Barry; *History of New England*, by Palfrey.

Massachu'setts Indians. Massachusetts when first settled was occupied by five Algonquin tribes, the Pennacooks, the Massachusetts, the Nausets, the Pokanokets, and the Nipmucks. These tribes were all friendly, save the Nausets, with whom Plymouth made a treaty of peace. Missions among the Indians were begun by the Mayhews, of Martha's Vineyard, in 1644, and by John Eliot two years later. After five years' work among

them, Eliot gathered the "praying Indians," as the converts were called, at Natick, and translated the Bible into their language. By 1674, the praying Indians numbered 3,200. The next year King Philip's war broke out, which began with the rising of the Pokanokets under their chief, Philip, and spread to the Nipmucks, Massachusetts, and Pennacooks. The frontier settlements were ravaged; the praying Indians were attacked by both reds and whites, and the savages were not conquered nor the war ended until the death of Philip in 1676. Many Indians were sent as slaves to the West Indies; the Pennacooks mostly joined tribes eastward, or in Canada; the others quieted down, and were given lands from time to time. They have since mostly intermarried with whites or negroes, and there are now less than a hundred full-blooded Indians in the state. See Abbott's *History of King Philip;* Moore's *Life of John Eliot.*

Massasoit (*mas'sa-soit*), a chief of the Pokanoket or Wampanoag Indians, ruled over most of south Massachusetts from Cape Cod to Narragansett bay. His tribe, once some 30,000 in number, shortly before the landing of the English had lost all but about 300 by a disease, probably the yellow fever. In 1621, three months after Plymouth had been founded, Massasoit and sixty warriors, armed and painted, came to the settlement and made a treaty of peace. This treaty was kept for fifty years, and Massasoit was always friendly to the settlers. His home was where now stands the town of Warren, R. I., and here he entertained Roger Williams for several weeks, when on his way to Providence after being banished from Massachusetts. Massasoit was honest, kept his word, and loved peace. He died in 1661. His son Pometacom, on his father's death, went to Plymouth and asked to be given an English name. He was named Philip, and became the leader of King Philip's war.

Massena (*mă-sā-nä'*), **Andre,** duke of Rivoli, prince of Essling, and the greatest of Napoleon's marshals, was born at Nice, Italy, probably of Jewish parents, May 6, 1758. He began life as a cabin boy, and served fourteen years in the Sardinian army. Early in the French revolution, he joined a battalion of volunteers, and rose quickly in rank, becoming in 1793, a general of division. He distinguished himself greatly in the campaigns in upper Italy, especially at Saorgio, Loano, and Rivoli, and earned from his commander his famous name of "Dear Child of Victory." After Jourdan's defeat at Stockach, in 1799, Masséna was given command of the army in Switzerland and by his crushing victory over Suvaroff's Russians at Zurich in September freed France from the danger of invasion. In 1804, he was made a marshal of the empire and commander of the army in Italy. He kept the Archduke Charles of Austria in check, crushed him at Caldiero, and overran Naples. During the peace that followed the campaign of 1807 he lost his left eye by an accident at a hunting party. In the campaign of 1809 against Austria, he commanded on the right bank of the Danube river and covered himself with glory at Landshut, Eckmühl, and Ebersberg-on-Traun. On the second day of the battle at Aspern, or Essling, with the greatest bravery he covered the retreat of the army across the Danube, and perhaps saved it from destruction, earning the title of prince of Essling. In 1810, he was sent to Spain to drive out the English, and drove Wellington back upon his intrenchments, at Torres Vedras. Finding it impossible to break the English lines, and harassed by lack of supplies, he made a masterly retreat, but was recalled in anger by Napoleon. He himself said his failure was owing to the disobedience of his captains Ney and Junot. However, he offered his services again when the emperor was making ready for the Russian campaign, but was only given a command in Provence. He submitted to the Bourbons at the restoration, and was made a peer. He refused to join Napoleon on his coming back from Elba, but also refused to sit on the court-martial of Marshal Ney. In strategy and tactics, Masséna was like Napoleon in quickness and ability, and was brave and unwearied on the battlefield. He died at Paris, April 4, 1817.

Massillon (*mă'sil-lŏn* or *mă-sē-yōn'*), **Jean Baptiste,** one of the greatest of French clerics and modern orators, was born at Hyères, in Provence, France, June 24, 1663. His father was a notary and wished Jean to become one too, but nothing could keep him from entering the service of the church. His power as a preacher was soon found out, and his funeral oration on the archbishop of Vienne won him fame and brought him to Paris, where he heard Bourdaloue, whose style and manner greatly influenced him. He first preached before Louis XIV. in 1699. It was to him that the king said: "I have heard great orators in my chapel and have felt satisfied with them, but every time I have heard you I have felt dissatisfied with myself"—a saying which shows the fearless eloquence of this great orator. In 1717, Massillon was made bishop of Clermont, and next year preached his famous series of ten short sermons for Lent before the young king, Louis XV. His last public discourse in Paris was his funeral oration on the duchess of Orleans in 1723. From this time he lived almost wholly for his bishopric, where his charity and gentleness gained him the love of all. He died Sept. 18, 1742. Bossuet and Bourdaloue rival him in oratory, but he was a greater preacher than either. Among his masterpieces are his sermons on the *Prodigal Son*, on the *Death of the Just and the Unjust*, and his sermon *For Christmas.*

Massillon (*măs'il-ŏn*), **O.**, a city in Stark county, in northeast Ohio, on the Tuscarawas river, the Ohio canal, on the Lake Erie, Pennsylvania, and Wheeling, and Cleveland, Lorain, and Wheeling railroads. It lies 65 miles south of Cleveland, is a good wheat-growing and nib coal-mining, and stone-quarrying belt. It has many industries, including iron-bridge, agricultural-implement, and threshing-machine works; paper, flour, and rolling mills; sandstone quarries, glass works, etc. It possesses some good schools, churches, banks, and public buildings. Population 11,944.

Massinger (*mas'in-jer*), **Philip,** an English dramatist, was born at Salisbury, England, in 1584. He studied at Oxford, 1602. In 1606, he went to London and is reported to have entered the Roman communion. Eighteen of his plays are still extant, the earliest being the *Virgin Martyr*, published about 1622. Notwithstanding his genius and the popularity of his plays, he lived in obscurity; and the course of his life in London is not easily traced. Among the works of Massinger that are best known may be mentioned *Duke of Milan*, *Fatal Dowry*, and *A New Way to Pay Old Debts*, which latter is still in use upon the stage. Fletcher and Decker were associated with him in the production of certain of his works. He was found dead in his bed March 16, 1640, and buried March 20, being entered upon the book of the parish church simply as "A Stranger."

Mas'todon, a large fossil elephant, remains of which are found abundantly in marshes and bogs in both Europe and America. In Kentucky, the bones of one hundred mastodons and twenty elephants were dug out of one bog. They have been found abundantly in New York, New Jersey, Indiana, and Missouri. Several very perfect specimens have been obtained from New York. Their bones are more massive than those of the elephant. These had attracted the attention of the Indians, who named the beasts to which they belonged "Fathers of Oxen." The mastodons were very large, being twelve or thirteen feet high, and including the tusks, twenty-four or twenty-five feet long. Their grinding teeth were provided with large rounded points like nipples, from whence came the name mastodon (Greek, *mastos*, the breast, nipple, and *odous*, tooth). Twigs of spruce and fir have been found lodged in the teeth, and, also, in considerable masses within the ribs where the stomach was situated. They seem to have become extinct in Europe at the close of the Tertiary period, while in America they lived through the Quarternary in association with primitive elephants. During the latter period of geological time those large beasts roamed in herds over North America, from the Gulf to the Arctic regions, in company with other representatives of the elephant tribe. See MAMMOTH.

Mastiff. See DOG.

Matabeleland (*măt'a-bē'le-land*), is the name given to a somewhat indefinite region lying north of the late South African Republic, the Transvaal, and estimated to contain over 60,000 square miles. North of it lies Mashonaland; east of it, the Portuguese east African possessions, and west of it German southwest Africa. The Zambesi river may be considered its northwest boundary. It used to be described as "part of Kaffraria"; but now it forms a part of what is called "Rhodesia." Its population is supposed to be in the neighborhood of 155,000, mostly natives. Its plateaus are well adapted to agriculture and admirably fitted for European settlement. It is supposed to be rich in mineral resources. About 5,000,000 acres have been surveyed; and at the capital, Bulawayo, there are several hotels, banks, and government offices. Two or more newspapers are published here. Bulawayo is also the center of considerable railway building, a line connecting it with Vryburg on the south, opened for traffic in November, 1897; and a section extending 150 miles to the north would have been opened in 1900 but for the war in the Transvaal. A line is laid out through Gwelo to the Zambesi, and northward to Lake Tanganyika. The native population is a branch of the Zulus, physically among the finest of the African races. They formerly lived far to the south, occupying part of the present territory of the Transvaal, but they removed to their present site about 1830. In 1879 the British broke up the confederacy of the Zulus by a hard-fought war; and in 1893 the South African company gave to the Matabeles a crushing and decisive defeat, from which they have never recovered. Matabeleland, on account of its fertile soil, temperate climate, and mineral resources, promises to be one of the most important links in the colonies which Great Britain is prepared to stretch from the Mediterranean to the Cape of Good Hope.

Matamoros (*mă-tă-mō'rŏs*), **Mariano,** a Mexican priest and patriot. Nothing is known of the time of his birth or of his early life. At the time of the Mexican revolution in 1811, he was parish priest of Jantelolco, a village south of Mexico. Here he was threatened by royalist troops and fled to Izucas, where he joined the rebels. Their chief, Morelos, at once made him a colonel, and he quickly became a popular leader and an able officer. In the defense of Cuantla the credit was given by Morelos, but was really due to Matamoros. He took part in the expedition to Oajaca, and won the victory of San Augustin del Palmar. The revolution had now triumphed over all Mexico, except in a few of the larger cities, but the cause was endangered by Morelos' hasty attack on Valladolid and rash battle of Puruaran. In this battle Matamoros was cap-

tured and was speedily executed, Feb. 3, 1814. The temporary failure of Mexican independence was probably due to the death of this patriot, whose memory is highly honored by the Mexicans.

Matanzas (*ma-tăn'zas*), a fortified town and seaport on the north coast of Cuba, 55 miles by rail east of Havana. It is the third largest city in Cuba, in a very rich district, with a good harbor. It has a large trade in sugar, molasses, rum, and cigars, and has several distilleries and iron foundries. Population 37,760.

Match'es, the name now given to splints of wood tipped with some composition (usually containing phosphorus), to produce light by friction. They came into general use about the year 1834. Before that time, light was produced by striking steel with a flint and catching the sparks on tinder (charred cotton). A flame was obtained by touching the burning tinder with punk, or strip of wood tipped with sulphur. Savage races sometimes obtain light by rubbing two bits of wood together. Other devices employed formerly were a lens to concentrate the sun's rays on some inflammable substance; a lamp for producing a jet of hydrogen gas, and kindling it by making it play on spongy platinum; a splint tipped with a mixture of chlorate of potash and sugar, which took fire on contact with sulphuric acid, and the lucifer match, invented fifty years ago, tipped with a paste of chemicals, which would take fire when drawn with a good deal of pressure across sandpaper. Phosphorus, introduced in 1834, was a great improvement. The chief operations in the manufacture of matches are: 1. Cutting the wood splints. 2. Immersing the splints in melted paraffine, or sometimes in sulphur. 3. Preparing the igniting composition and dipping the splints into it. Matches are made of pine or aspen wood. This is sawed into blocks, which are then forced endwise through thick steel plates full of little holes, with sharp edges, and just the size of a match. The splints thus formed are then fed by thousands to dipping frames by filling machines (of which there are several kinds, and of American invention). In the dipping room the igniting composition is spread on a hollow iron table, kept hot by steam, and the splints are dipped into it. Nearly every manufacturer has his own special mixture for the dipping of matches, and phosphorus is an important element in all of them; but in the case of so-called safety matches there is phosphorus only on the prepared surface upon which they are ignited. Match making is an important industry in the United States, Great Britain, France, Germany, Sweden, and Norway.

Mather (*măth'er*), **Increase,** was born at Dorchester, Mass., June 21, 1639. He graduated at Harvard in 1656, and at Trinity college, Dublin, two years later. He entered the ministry and preached in Devonshire and Guernsey before going back to America. From 1664 until his death he was pastor of the North Church at Boston. From 1685 to 1701 he was president of Harvard college and was the first minister in America to receive the degree of doctor of divinity. When, in 1684, Charles II. annulled the charter of the colony, Mather was sent to England as the agent of Massachusetts. Unable to get the old charter restored, he took back in 1692 a new one, under which the naming of the crown officers was left to him. A day of thanksgiving was appointed for his safe return and the success of his mission. Mather studied sixteen hours a day, always gave a tenth of his income in charity, and in every way was a man of careful habits. He was also one of the earliest of American writers. Of his many works, perhaps the best known is his *Remarkable Providences*. Increase Mather died at Boston, Aug. 23, 1723.

Math'er, Cotton, son of the preceding, was born at Boston, Feb. 12, 1663. He graduated at Harvard in 1678. When only fourteen he began a regular system of fasts, which he kept up all his life. Wishing to enter the ministry, he conquered an impediment of speech, and became his father's assistant in the North Church at Boston. He was much interested in civil affairs and drew up the declaration of the colonists justifying the imprisonment of Governor Andros. In 1685, appeared his *Memorable Providences Relating to Witchcraft and Possessions*, which was used as an authority in the Salem witch trials. In 1688, the children of John Goodwin were suspected of being visited by the devil, and Mather, with three other ministers, held a day of fasting and prayer over the cases. His *Wonders of the Invisible World* was written to prove to the world the reality of witchcraft. Both he and his books did much to fan the cruel fury of the New Englanders, and while it is true that the main body of the colonists fully shared his belief, none equaled him in hateful zeal, and on his head rests the heaviest burden of bloodguiltiness. Afterward he confessed that "there had been a going too far in that affair." Both his industry and his learning were remarkable and poured from the press as many as 382 books. Of these the chief is *Magnalia Christi Americana*, a mass of materials for the church history of New England. His *Essays to Do Good* were much liked by Franklin. Cotton Mather died at Boston, Feb. 13, 1728. See Charles W. Upham's *History of the Salem Delusion.*

Math'ew, Theobald, commonly known as "Father Mathew," the Irish apostle of temperance, was born at Thomastown, Tipperary, Ireland, Oct. 10, 1790. He studied for the priesthood and entered the order of the Capuchins. As a Capuchin father at Cork, he found that the poverty and wretchedness of his people

was due in great measure to over-drinking, and he became an earnest preacher of total abstinence. His crusade, begun in 1838, soon spread to Dublin, Liverpool, Manchester, London, Glasgow, New York, and wherever there were Irishmen. His success was marvelous. Each pledge-taker was given a medal, which was looked upon with the greatest reverence, and among the poor it was generally believed that the "Apostle of Temperance" was miraculously aided in his work by heaven. During his last years his unthinking charity brought him to poverty. The enthusiasm for his cause died away amid the sufferings of the potato famine, and Father Matthew died at Queenstown, worn out by his labors, Dec. 8, 1856. See Harriet Martineau's *Biographical Sketches*, and his *Life* by F. J. Matthew.

Matsys (*măt-sis'*), **Quentin,** Flemish painter, was born at Louvain, Belgium, about 1466, and is said to have first been a blacksmith. He settled at Antwerp in 1491 and there died in 1530 or 1531. His pictures are mostly religious, and are remarkable for their glow of color, their absence of light and shade, and their fine finish. The *Burial of Christ*, *Martyrdom of John the Baptist*, and *The Money-Changers* are among his best pictures. Matsys also takes high rank as a portrait-painter. He seems to have been acquainted with Holbein, Dürer, Erasmus, Sir Thomas More, and other noted men of the time.

Matterhorn (*măt'ter-horn*), called by the French Mont Cervin, and by the Italians Monte Silvio, is a peak of the Alps in the Swiss canton of Valais and Piedmont, which rises 14,705 feet high. The peak was first scaled by a party of four Englishmen and three guides, July 14, 1865, when two of the party fell over the precipice and were killed. See Whymper's *Ascent of the Matterhorn.*

Matth'ew (meaning *Gift of Jehovah*), one of the twelve apostles, and held to be the author of the first of the four gospels. He was a publican, or tax-gatherer, at Capernaum, when called by Jesus to follow him. Except in the four lists of the disciples, Matthew is nowhere mentioned by name in the New Testament. An early authority speaks of his having died a natural death; by other writers he is said to have suffered martyrdom after preaching in Parthia and Ethiopia. Papias, a bishop of the second century, tells us that "Matthew wrote in the Hebrew dialect a collection of the sayings of the Lord, and each one interpreted them as best he could."

Matthews (*măth'ūs*), **James Brander,** an American author and professor, was born at New Orleans, La., Feb. 21, 1852. He graduated at Columbia college in 1871; took the degree of bachelor of laws in 1873, and was soon thereafter admitted to the bar. He, however, preferred literary pursuits and gave his whole attention to authorship, becoming one of the founders of the Authors' club. He has published over thirty separate volumes, edited a great many editions of popular works, and contributed numberless articles to the periodicals. Since 1892 he has filled the chair of literature at the college of his graduation. His best-known works are *Americanisms and Briticisms*, *Vignettes of Manhattan*, and *Introduction to the Study of American Literature.*

Matth'ews, Stanley, an American jurist, was born at Cincinnati, July 21, 1824. Graduating at Kenyon college, Gambier, O., he was admitted to the bar in Tennessee, but soon returned to Cincinnati, where he was made one of the editorial writers for the *Herald*, a vigorous antislavery paper with which he was connected for several years. He was successively county judge, state senator, and United States attorney; but March, 1861, he entered the volunteer army, soon rising to the rank of colonel. In 1863, he resigned and became judge of the superior court of Cincinnati. In March, 1877, he was elected United States senator. In 1881, he was appointed by President Garfield one of the associate justices of the United States supreme court. He died at Washington, D. C., March 22, 1880.

Matthias (*măt-tē'ăs*), **Corvinus,** king of Hungary, the second son of the regent John Hunyady, was born at Klausenberg, Hungary, March 27, 1443. On the death of his father, his brother was slain and himself imprisoned by order of Ladislaus, king of Hungary and Bohemia. After the death of Ladislaus he was chosen king (1458), but it cost him a six years' hard struggle against Turks, Bohemians, the Emperor Frederick III., and his own nobles, before he could venture to have himself crowned. He drove the Turks out of his kingdom, in which they had gained a footing, and won from them Bosnia, Moldavia, and Wallachia, before he granted them a truce. This breathing-space he used in making war on his father-in-law, the king of Bohemia, and that king's successor, Ladislaus of Poland. In the midst of this war he had to put down a rebellion of the Hungarian magnates, who offered his throne to Casimir, a brother of Ladislaus. In 1478, he brought the war to a close, getting possession of Moravia, Silesia, and Lusatia. In 1485, a war with Frederick III. ended in the siege and capture of Vienna by Matthias. Vienna was made the Hungarian capital, and a large part of Austria proper fell before the conqueror. The crushing of the Turks, in 1479, at Kenyermezö, by Stephen Bathori, added another to the victories of this reign. Matthias was not merely a conqueror: he founded the University of Budapest summoned scholars and artists to his court, and enriched his capital with the works of the most renowned sculptors. At the same time, wise laws made the country prosperous, and justice was dealt

out to noble and peasant alike. He, however, ruled like a despot, and his taxes were heavy and exacting. Matthias died at Vienna, April 6, 1490.

Mauch Chunk (*mȧk' chŭnk'*), a mining town of Pennsylvania, lies among picturesque hills on the Lehigh river, 90 miles northwest of Philadelphia. There is a switch-back railroad, nine miles long, from the town to Summit Hill, famous for its burning mines, which have been on fire since 1858. Population 4,029.

Mauna Kea (*mou'nȧ kē'ȧ*) on the island of Hawaii, the highest mountain in the Hawaiian islands, and in Polynesia, rises 13,953 feet above the sea. It is a volcanic dome, and its craters have not long ceased their eruptions. Its top is covered with snow most of the year, and herds of wild cattle roam in the woods that cover the mountain-side.

Mauna Loa (*mou'nȧ lō'-ȧ*), a volcanic mountain of Hawaii, 13,760 feet in height. It is wholly made up of lava that has been thrown out in a fluid state. It is a smooth, regular dome in shape, with forests on its flanks at an elevation of 5,000 feet. It has many craters near the top and on the sides, and new ones sometimes open. The top crater, called Mokuaweo-weo, is round in form, and 8,000 feet across, and about 1,000 feet deep. The eruptions are often like lava-fountains, spouting from the top of the mountain. In 1859, one of these fountains for four or five days sent up a stream of white-hot fluid lava, about 200 feet through and 200 or 300 feet high, lighting up the horizon for 150 miles. In 1868, the lavas forced their way for 20 miles underground, and then burst through a fissure two miles long. Here four fountains spouted, sometimes joining in one fountain two miles in length, throwing up crimson lava and red-hot bricks 500 or 600 feet high.

Maurice (*maw'riss*, German *mo'rits*), "elector of Saxony," a German general, was born at Freiberg, Saxony, March 21, 1521. In 1542, he fought under the Emperor Charles V., against the Turks, and the next year against the French. He fought also with Charles at the battle of Mühlberg in 1547, in which the Smalkald league of German Protestant princes was defeated, though its two leaders were his father-in-law, Philip, landgrave of Hesse, and his cousin, John Frederick, elector of Saxony. Though John Frederick's dominions and title were given to Maurice, the fact that he was himself a Protestant, together with Charles' treacherous arrest of the landgrave, and other despotic acts, soon cooled his devotion to the emperor. Ordered to proceed against the rebellious city of Magdeburg, he had an excuse for raising an army under Charles' very eyes. A secret treaty was made with France, and on his demand for his father-in-law's freedom being refused, he suddenly appeared before Innsbruck, where Charles was lying very sick of the gout, in 1552. Charles barely escaped by flight, only to find Lorraine overrun by French troops. By this sudden and successful move, Maurice forced from the great emperor not only the release of Philip of Hesse, but also the treaty of Passau, July 16, 1552, which granted the fullest liberty of worship to Protestants. The next year Maurice headed a league against the margrave, Albert of Brandenburg, who would not acknowledge this treaty, and crushed him at the battle of Sievershausen, near Hanover, but was himself wounded and died two days later, July 11, 1553.

Maurice (*maw'riss*), **John Frederick Denison,** one of the leading thinkers and social reformers of his time, and the son of a Unitarian minister, was born at Normanston, England, Aug. 29, 1805. He studied at Cambridge, then went to London, where he was editor of the *Athenæum* for a time. He entered the Church of England, and in 1837 was appointed chaplain to Guy's hospital. In 1840, he became professor of literature at King's college, London, where he was professor of theology from 1846 till 1853. In 1866, he became professor of moral philosophy at Cambridge. Among his books are, *Prophets and Kings of the Old Testament*, *Gospel of St. John*, and *The Kingdom of Christ*. Maurice was the mainspring of the movement known as *Christian Socialism*, and the president of the society for encouraging workingmen's associations. He was also the founder, at London, of the Workingman's college and Queen College for Women, in both of which he taught. He died at London, April 1, 1872. See *Life of Maurice*, by his son, Colonel Maurice.

Maurice (*maw'riss*), **Prince of Orange** and **Count of Nassau,** one of the most skillful generals of his age, was the son of William the Silent, prince of Orange, and was born at Dillenburg, North Germany, Nov. 14, 1567. After his father's assassination, in 1584, the provinces of Holland and Zealand, and afterward Utrecht and the other Netherland provinces, chose him as their stadtholder. A great part of the Netherlands was still in the hands of the Spaniards; but under the leadership of Maurice the Dutch rapidly wrested cities and fortresses from their enemies. In 1597, he defeated the Spaniards at Turnhout, and in 1600 crushed them at Nieuwport. Then for more than three years he baffled the whole power of Spain by his defense of Ostend. At last, in 1609, Spain reluctantly acknowledged the United Provinces a free republic. A faction fight between the "Orange" party and the "Remonstrants," led by Olden-Barneveldt, was not ended by the victory of the former party till 1621. At once Maurice renewed the war with Spain. He died at The Hague, April 23, 1625.

Mauritania. See MOROCCO.

Mauritius (*maw-rish'-i-us*), or **Isle of France,** an island and British colony in the Indian ocean, 500 miles east of Madagascar. It is of volcanic formation. A girdle of reefs, broken only by passages at the mouths of the small streams, makes it difficult of approach. The surface is a tableland rising into ridges 500 to 2,700 feet high, the highest peak, Rivière Noire, being 2,711 feet above sea level. Lava and basalt rock and volcanic lakes occur. The picturesque beauty of the Isle of France, as the French called it, covered with forests, is described in St. Pierre's *Paul and Virginia*, and Besant and Rice's *My Little Girl*. But in the 19th century, the woods have been cut down to make room for sugar-cane plantations. Among the native trees are the ebony, cocoanut palm, bamboo, benzoin, ironwood, and traveler's tree. There are many tropical fruits, besides food plants, as sugar, vanilla, coffee, cocoa, corn, rice, yams, manioc, etc. Terrific cyclones are common. In 1854, the cholera carried off 17,000 people and thirteen years later 30,000 died of fever. The educated upper classes are mostly descendants of the French colonists. There are a number of negroes, Malagasy, Singhalese, Malays, and Chinese; but the bulk of the people are coolies who have been brought in nearly every year since 1842 to work the sugar-fields. The capital is Port Louis (population 52,517). The great crop is sugar, though large quantities of rum, cocoanut-oil, vanilla, Mauritius hemp, aloe fiber, drugs, and caoutchouc, are also exported. Mauritius is a British colony, and is ruled by a governor and executive council. The island was discovered by Mascarenhas in 1507, who found it uninhabited. The Portuguese abandoned it, and it was seized by the Dutch in 1598, who named it after their Prince Maurice; but they in turn abandoned it in 1710. The French were its next masters, and introduced sugar-raising, which made its prosperity. The English got possession in 1810. The area of the island is 705 square miles. Population 371,655. See works by J. G. Baker, G. Clark, and Keller's *Madagascar, Mauritius, and other East African Islands.*

Maury (*mâ'ri*), **Matthew F.,** an American naval officer and scientist, was born near Fredericksburg, Va., Jan. 14, 1806. In 1825, he entered the navy as midshipman on the *Brandywine*, then fitting out to take Lafayette to France. The next year his ship made a voyage to the Pacific, where he was transferred to the *Vincennes*, in which he sailed around the world. During this cruise and while still a passed-midshipman, he began his *Treatise on Navigation*, which was used as a text-book in the navy. After thirteen years' service he became lieutenant, in 1837, but two years later an accident lamed him for life and unfitted him for service afloat. In 1842, he was made superintendent of the hydrographical office at Washington, and two years later of the observatory. Here he made careful observations on winds and currents, from the results of which he wrote his *Physical Geography of the Sea*, and his works on the *Gulf Stream, Ocean Currents*, and on *Great-Circle Sailing*. Maury was made a commander in 1855, but when his state seceded he joined the Confederate navy. After the war, he was professor of physics in the Virginia Military institute at Lexington. He was a member of the scientific societies of Europe, and was practically the founder of the new and important science of hydrography. Professor Maury died at Lexington, Va., Feb. 1, 1873. See his *Life*, by his daughter.

Max'im, Sir Hiram S., American inventor, was born in Maine, Feb. 5, 1840, and became famous as the inventor of the automatic cannon known by his name. His first completed gun was exhibited in 1884. The principle of this gun was making the recoil of the weapon load and fire the weapon. He succeeded in making a gun that would fire six hundred shots a minute. The gun was first used in actual warfare by the British in Matabeleland. It was soon adopted by the French navy and now, under various names, is in use by all governments. He also invented a smokeless powder, incandescent lamps, and search-lights to be used on board men-of-war. He received a number of decorations from European courts. He was also made a member of many scientific associations. He has resided in England many years, and having transferred his citizenship to that country was knighted in 1901.

Maximilian (*maks-i-mil'yan*) **I.,** German emperor, the son of Frederick III., was born at Neustadt, near Vienna, March 22, 1459. When only nineteen he married Mary, the heiress of Charles the Bold, by which he gained Burgundy and Flanders. But this brought him into war with Louis XI. of France, the French kings having for many years cast longing eyes toward Flanders, and after the death of his wife, in 1482, Maximilian was forced to give Artois and Burgundy to Louis. In 1486, he was chosen king of the Romans. In 1490, he drove out the Hungarians, who, under Matthias Corvinus, had seized a great part of the Austrian territories on the Danube, and at Villach, in 1492, he routed the Turks. Artois and Franche-Comté were ceded to Maximilian by Charles VIII. of France, to prevent war between the two rivals for the hand of Anne of Brittany, who married Charles. The death of his father, in 1493, made Maximilian emperor. His marriage with the daughter of the duke of Milan turned his ambition toward Italy; but after many changes of fortune, he was driven to give up Milan to France and Verona to the Venetians. Nor was he more successful against the Swiss, who in 1499 freed themselves from German rule. He, however,

gained Tyrol by peaceful means; the houses of Spain and Hapsburg were joined by the marriage of their children, and the marriage of his grandson, Ferdinand, brought Hungary and Bohemia to Austria. Maximilian put an end to the feuds of his nobles, improved the courts, and divided the empire into six (afterward into ten) circles, each ruled by a governor. He also encouraged the universities of Vienna and Ingoldstadt, in learning and arts generally. He was well educated, skilled in all bodily exercises, chivalrous and genial; so that he has been called "the first knight of his age." Maximilian died emperor of the Holy Roman Empire, at Wels, in Upper Austria, Jan. 12, 1519. See Coxe's *History of the House of Austria.*

Maximilian (*măks-ĭ-mĭl'yan*), emperor of Mexico. Ferdinand Maximilian Joseph, archduke of Austria, was born July 6, 1832, at Vienna, and was the younger brother of Francis Joseph I. He became an admiral of the Austrian navy, and in 1857–59 he was popular as governor of the Lombardo-Venetian territory. In 1862, the French interfered in the affairs of Mexico, and the next year called together an assembly of notables, which offered the crown to Maximilian. After carefully reviewing the offer he accepted it, and in June, 1864, he entered Mexico. For a time all went well, but he was unable to keep the Mexican parties at peace. The republican leader, Juarez, again raised the standard of independence; and soon after (1866) Louis Napoleon was forced to think of withdrawing his troops. In vain the Empress Charlotte went to Europe to enlist aid for her husband; her reason gave way under the strain of excitement and grief brought on by disappointment. When the French withdrew, Maximilian felt bound in honor to stay and share the fate of his followers. At the head of 8,000 men he made a brave defense of Querétaro against a republican army under Escobedo. In May, 1867, he was betrayed and tried by court-martial, and on July 19 he was shot. His death was directly due to his own fatal edict of Oct. 3, 1865, that all Mexicans taken in arms against the empire should be shot without trial. See Kendall's *Mexico under Maximilian.*

Max-Muller (*mŭ'ler*), **Friedrich,** was born at Dessau, Germany, Dec. 6, 1823. His father, Wilhelm Müller, one of the greatest German lyric poets, died when Friedrich was four years old. He took his degree at Leipsicin 1843, and devoted himself to the study of Sanskrit. In 1847, the East India company commissioned him to edit the *Rig-Veda* at their expense. In 1854, he became professor of modern languages at Oxford. Max-Müller published treatises on many language topics, which have done more than the labors of any other single scholar to awaken in England a taste for the science of language, and by his happy illustrations has made attractive, subjects ordinarily dry. In 1875, he resigned his professorship and edited a series of translations of the *Sacred Books of the East.* Among his books are *Chips from a German Workshop, Comparative Mythology, The Science of Thought, Physical Religion, Selected Essays on Language, Mythology, and Religion, The Science of Language,* and *The Origin and Growth of Religion.* He died at Oxford, England, Oct. 28, 1900.

F. MAX-MÜLLER.

Max'well, James Clerk-, a very remarkable English physicist and one of the most brilliant and profound minds known to the history of physical science. He was born at Edinburgh, June 13, 1831, and there received his early training, first at the Edinburgh academy and afterward at the university. In 1850, he went to Cambridge university, from which he graduated, second wrangler, in 1854. From 1856 to 1860, he held the chair of physics in Marischal college, Aberdeen, and, for the next eight years, a corresponding position in King's college, London. Three years of retirement on his estate at Glenlair now intervene between his London residence and his acceptance of the newly created chair of experimental physics at Cambridge, where he lived and worked almost to the time of his death in 1879. Genius showed itself very early in his career; for, at the age of 15, a paper of his, on a mechanical method of drawing Cartesian ovals, was considered worthy of presentation to the Royal society of Edinburgh. His first great memoir was that which he offered in successful competition for the Adams prize in 1859. In this paper he proves, from purely dynamical grounds, that the rings of Saturn are made up of discrete particles, else these rings would not be stable. His investigations in the *Kinetic Theory of Gases* place him, with Bernoulli, Clausius, and Boltzmann, as one of the founders of that science. Towering above everything else, however, is his *Electromagnetic Theory.* His work began with a paper on *Faraday's Lines of Force,* which he later extended and perfected so that we have, in his *Treatise on Electricity and Magnetism,* a complete theory of the entire subject from Faraday's standpoint, that is, from the point of view which replaces all action at a distance by action through a medium. Ever since its publication, in 1873, this has been the standard treatment of electricity either in the English or in any other language.

As early as 1864, Maxwell predicted that electrical vibrations, if they could be produced, would have the same properties as light vibrations. It was not until 1888, nearly twenty years after Maxwell's death, that Hertz showed how to realize these electric oscillations in the laboratory and proved that Maxwell's equations had predicted the exact truth. These are precisely the electrical vibrations which Marconi and others have employed, since 1896, in wireless telegraphy. This discovery of Maxwell's may be stated more simply, perhaps, by saying that he showed that *optics* is merely one department of the subject of *electricity*.

His two small volumes, one on *Matter and Motion*, the other on the *Theory of Heat*, are marvels of elegance, conciseness, and clearness. They should be read by everyone who wishes to know the man. His collected *Scientific Papers* have recently been published by the *Cambridge Press*, in two superb quarto volumes.

Even this brief sketch of Maxwell would be incomplete without adding that, aside from his scientific attainments, his modesty, his genial humor, and his high Christian character endeared him to everyone who knew him. A more charming biography than the *Life of James Clerk-Maxwell*, by his friends Louis Campbell and William Garnett (London, 1884), would be difficult to find.

May, the fifth month of the year. The first of May has always been a gala day. The May festival goes back to the Floralia festival of the Romans, which probably came in the first place from India. The festival is still kept up by the Italians, under the name of "Calendi di Maggio"; young people sallying forth at daybreak to gather boughs with which to adorn the doors of relatives and friends. In England, as we learn from Chaucer and Shakespeare, it was customary during the middle ages for all, both high and low — even the court itself — to go out on the first May morning at an early hour "to fetch the flowers fresh." Hawthorn branches were also gathered, and were brought home about sunrise with blowing of horns and all possible signs of joy and merriment. The people then decorated the doors and windows with the spoils of spring. The hawthorn bloom was called the "May," the ceremony "the bringing home the May," and the trip to the woods "going a-Maying." The fairest maid of the village was crowned with flowers as the "Queen of the May," and placed in a little bower or arbor, where she sat in state, receiving the homage of the youthful revelers, who danced and sang about her.

Every town and village, too, had its fixed pole — called the Maypole — on which each May morning were hung wreaths of flowers, and round which the people danced in rings most of the day. A hard blow was given to Mayday by the Puritans, who had the Maypoles uprooted and a stop put to all these merry customs. They were, however, revived after the Restoration, but have now almost died out. In France and Germany, too, Maypoles were common, and in some places can still be seen. With Catholics the month of May is celebrated as the Virgin's month.

Mayence (*mā-yons'*) or **Mainz** (*mints*), the capital and largest town of the grand-duchy of Rhenish Hesse, Germany, on the river Rhine, near its union with the Main. It is a fortified city, with a double wall, bastions, and outworks, and a citadel in the center, and commands both sides of the Rhine. There is a monument to Gutenberg, with a statue by Thorwaldsen, and a bronze statue of Schiller in the public squares. The house in which Gutenberg was born is still standing, and also the one where he had his first printing press. Mayence is an old city, having been a place of importance under the Romans. Destroyed by the barbarians, in 406, it was rebuilt by the Frankish kings. It was the head of the league of Rhenish towns in the 13th century, and through Gutenberg became the bookmaking center. It was taken by the Swedes in 1631, by the French in 1644, and in 1688 by the Saxons, and Bavarians in 1689, and by the Prussians in 1793. In 1801, it belonged to France, but in 1816, was assigned to Hesse-Darmstadt. Since 1871 it has been a fortress of the German empire. Population 76,946.

May'nooth, a village in county Kildare, Ireland, fifteen miles northwest of Dublin. It is chiefly interesting from St. Patrick's Roman Catholic college, established in 1795 by an act of the Irish parliament for the education of the Irish priesthood. After the union of the two countries, the English parliament kept up the yearly endowment paid the college by the Irish parliament. The college received 500 students named by the Irish bishops. In 1869, a stated sum was given the trustees, and all connection with the government ceased. A new chapel was finished at a cost of $250,000 in 1890.

Mazarin (*mdz-a-rēn'*), **Jules**, cardinal and chief minister of France during the youth of Louis XIV., was born July 14, 1602, at Piscina, Italy. He studied under the Jesuits at Rome and at Alcala in Spain, and next entered the military service of the pope. His ability for diplomacy was early seen, and he accompanied a papal legate to the court of France. Here he met Richelieu, who foreseeing his future, engaged him to further French interests in Italy. In 1639, he openly entered the service of Louis XIII., was naturalized a Frenchman, and through Richelieu's influence gained a cardinal's hat. Richelieu further, before his death, recommended Mazarin to the king as his successor. He was a man of affairs, and had so much personal charm that he ruled with less friction than Richelieu, though with almost as great power. The

opposition of parliament to his taxes, followed by the arrest of the leaders, brought on the first of the wars of the Fronde. However, by the aid of Condé, the court triumphed, and though the hated taxes were abolished, Mazarin kept his office. The hatred against him, however, blazed out in the provinces, when he had Condé and Conti arrested in 1650. He had to go into exile, and the press teemed with pamphlets and satires against him — the famous Mazarinades. He now saw his mistake in separating himself and the queen from every party in the state, and bent all his masterly powers to form a new royal party. Turenne was gained over, and his military genius was more than a counterpoise to that of Condé, who was opposed to the court. In 1653, Mazarin came back in triumph to Paris, and from this time his power was re-established, while he quickly regained his popularity. Under his rule, the influence of France abroad was greatly increased. He gained the alliance of Cromwell by giving up Dunkirk; made French influence felt in southern Germany by the treaty of Westphalia in 1648; while the league of the Rhine, formed in 1659, and in the same year the marriage of Louis XIV. with the infanta Maria Theresa, made France a claimant of the throne of Spain. Mazarin died at Vincennes, France, March 9, 1661. See Gustave Masson's *Mazarin*.

Mazeppa (*mȧ-zep'ȧ*), **Ivan Stephanovich,** hetman or chief of the Cossacks, was born in 1664, of a poor but noble family of Podolia, Poland. He became a page at the court of John Casimir, king of Poland. A jealous nobleman had him stripped naked, and bound on his own horse, lying on his back and with his head to its tail and let the animal loose, leaving Mazeppa to his fate. The horse carried him, senseless from exhaustion, to its native wilds of the Ukraine, according to the usual story. A more likely account is that his horse carried him through woods and thickets and brought him back, torn and bleeding, to his own home. Mazeppa now joined the Cossacks, became secretary to their hetman, Samoilovich, and in 1687 was chosen his successor. . He won the confidence of Peter the Great, who loaded him with honors, and made him prince of the Ukraine. But when Russia interfered with the freedom of the Cossacks, Mazeppa determined to free them from the rule of the czar, and to this end conspired with Charles XII. of Sweden. Peter the Great discovered the treason, but for a long time refused to believe it. Mazeppa's hopes perished in the disastrous battle of Pultowa, in 1709, and with Charles he fled to Bender, the Russian fortress in Bessarabia, where he died the same year. His story is the subject of a famous poem by Byron, and of two paintings by Vernet.

Mazzini (*mȧt-sē'nē*), **Giuseppe,** Italian patriot, born at Genoa, June 22, 1805. He went to the University of Genoa when only thirteen, and before he was nineteen was a practicing lawyer. In 1821, the sight of the refugees from the unsuccessful rising in Piedmont stirred him to devote himself to freeing his country. As a member of the Carbonari he was arrested and imprisoned in 1830. When set free the next year, his life-plan was settled. His first step was the formation at Marseilles of the Young Italy association. The first and last duties of its members was to work to make a free, independent, and united nation of Italians. The great mass of the people were to be educated to understand their rights, and taught to secure them, if need be, by force. Shortly after Charles Albert became king of Sardinia, Mazzini urged him to put himself at the head of the struggle for national independence. His answer was a sentence of banishment, and soon the French expelled him too, but he managed to hide in Marseilles. From this time he led "a life of voluntary imprisonment within the four walls of a little room" for over twenty years. During this time he was the most untiring political agitator in Europe, the man most dreaded by its absolute governments. He was always writing, and so eloquently and sincerely, that he aroused his followers to an enthusiasm that would dare anything. In 1834, he organized an invasion, which failed, chiefly because of the lukewarmness or treachery of the soldiers to whom it was intrusted. From his headquarters, in Switzerland, his organization was extended throughout Italy. Banished from Switzerland he went to England, where for seven years he struggled hard against poverty, yet managed to help his poorer, ignorant countrymen, the London hand-organ boys, by teaching and civilizing them in night-classes. In 1844, the English government was forced by a storm of indignation, in which Carlyle took a leading part, to apologize for opening Mazzini's letters and sending their contents to the rulers in Italy.

On the outbreak of the Lombard revolt, in 1848, Mazzini threw himself into the heart of the struggle, though the king of Sardinia sought to win him over by the offer to make him the first minister of the new Piedmontese-Lombard state. When the revolt in Lombardy failed, he made his way to Tuscany. Leghorn received him with wild enthusiasm in February, 1849, the day before the republic was proclaimed at Rome, and elected him her deputy to the republican assembly in the papal city. On March 29, Mazzini was chosen one of three triumvirs with the powers of dictators. They chose as their motto, "God and the People." But on April 25 the French arrived before Rome and after a hard struggle the republic fell. Mazzini made his way back to London, where he planned the risings of the following years at Mantua, Milan, Genoa, and Leghorn. He was sentenced to death three times, but died peace-

fully at Pisa, Italy, March 10, 1872. Italian nationality is chiefly due to three men, Mazzini, Garibaldi, and Cavour. Perhaps it is safe to say that Mazzini prepared the soil, sowed the seed, and fostered the growing plants that Garibaldi gathered in the ripe fruit; but it was Cavour who gained the final advantage of the harvest. See Marriott's *Makers of Modern Italy*.

Mead, Larkin Goldsmith, an American sculptor, was born at Chesterfield, N. H., Jan. 3, 1835. His early years were spent in Vermont. He studied art at Brooklyn, N. Y., and in Italy. The *Recording Angel*, his first work, was modeled in snow and afterward cut in marble. His large pieces have been executed for public buildings and monuments; such as the colossal statue of *Vermont*, on the dome of the statehouse, and of *Ethan Allen* in the portico of the same building in Vermont, and one of the same hero, given by the state of Vermont to the hall of representatives at Washington. The statue of Lincoln on the monument at Springfield, and a group representing *Columbus before Queen Isabella*, for the state of California, the *Returned Soldier*, and the *Return of Proserpina from the Realms of Pluto*, which was over the main entrance of the Agricultural building at the World's Columbian exposition, Chicago, are other specimens of his larger statues.

Meade, George Gordon, an American general, born at Cadiz, Spain, Dec. 31, 1815. In the Mexican war he was on the staff of General Taylor, and afterward of General Scott, and won honor at the battles of Palo Alto and Monterey. From 1856 to 1861, he was in charge of the surveys of the Great Lakes. In the Civil war, he was in command first of the Pennsylvania brigade, and fought in the battles of Gaines' Mill and Frazier's Farm, where he was severely wounded; at South Mountain, Antietam, and Fredericksburg. He was in command of different corps of the army of the Potomac. Meade succeeded Hooker in the command of the army of the Potomac, and fought the battle of Gettysburg, July 1–3, 1863, receiving in 1866 the thanks of Congress for "his skill and heroic valor." He was made major-general in the regular army in 1864, and retained the command of the army of the Potomac, under General Grant, during the battles of the Wilderness, the siege of Petersburg, etc., until the close of the war. He was in command of the division of the Atlantic, 1865–66; of the department of the east, 1866–67; and later of the military district, which included Georgia, Alabama, and Florida. His headquarters were at Philadelphia, where he died, Nov. 6, 1872, at his home, the gift of his grateful fellow-citizens. See GETTYSBURG.

GEN. G. G. MEADE.

Meadow Lark (*mĕd'ō lark*), a bird belonging to the family of American Orioles. It lives in meadows, but is not a lark. It is essentially a ground bird, feeding on the ground, and making its nest in a tuft of grass. The bird is black, brown, and buff above, and yellow below, with a black crescent crossing the breast. They are sweet singers, and usually when singing seek a high and exposed perch. They feed on larvæ, worms, beetles, grass seed, etc. In autumn they collect in small flocks of ten or twelve and visit marshes and stubble fields.

Mead'ville, Pa., capital of Crawford county, on the Venango river, in northwestern Pennsylvania, 125 miles north of Pittsburg. It is on the Erie railroad, and in railroad connection with Pittsburg and Lake Erie. It is the seat of a number of educational institutions, schools, colleges, conservatories of music, and half a dozen libraries. Here is Allegheny college, a Methodist Episcopal institution, with some 20 instructors and 350 students; also a Unitarian Theological college. Its industries include manufactures of engines, boilers, leather-belting, oil-well supplies, wood mantels, sashes, and blinds. The city has good water-works, natural gas for fuel and lighting, electric-light plants, etc. Population 10,291.

Meas'urement consists essentially in the comparison of one quantity with another. Thus the measurement of a length, which is one of the simplest of all measurements, consists in determining how many times greater or less the given length is than some other given length which we agree to take as a unit. In like manner, an interval of time is "measured" by comparing it with the interval which we employ as a unit, namely, the mean solar day. Evidently, therefore, it is possible to measure a quantity without understanding very much about that quantity. No intelligent measurement, however, can be made unless one understands just what quantities are necessary to define the quantity about to be measured. Thus the position of a point in space is intelligently measured only when we know that three definite and independent co-ordinates are required to locate the point, and when we have determined the numerical values of these three co-ordinates. To measure the kinetic energy of a body in translation we must know how many units of mass there are in the body and with how many units of speed it is moving. Thus also we may measure accurately and definitely the acceleration of gravity at various points

on the earth's surface, and yet not know the explanation of gravitation.

It has been found that practically all the quantities involved in physical science and engineering can be measured in terms of three quantities, viz., a *length*, a *time*, and a *mass*. The units of these three quantities are, therefore, called the *fundamental* units.

The standard of length, except in English and American commerce, is the *metre;* the standard of time the *mean solar day;* and the standard of mass is the *kilogramme*. (See KILOGRAMME, EARTH, and METER.) Units are founded upon standards, but they are often different in size from standards, and may be chosen of a size which, for any particular purpose, is most convenient. Thus, in physics the centimetre, or $\frac{1}{100}$ of a metre, is most frequently employed; and in astronomy the second ($\frac{1}{86400}$ of a day) is frequently a very convenient unit of time, while often the year (or 365 days roughly speaking) is more convenient.

It is a well-established principle that no physical measurements can be carried out with absolute accuracy. Every comparison is affected with error to some extent. Even the standard meter at Paris, which is correct by definition, may be changing its length owing to crystallization. The rate of rotation of the earth is probably diminishing (and hence the length of the mean solar day increasing) owing to tidal friction. So that, even if comparisons could be made with perfect accuracy, the final measurement would still be affected with error. On the other hand, the precision of modern measurement almost surpasses belief. Michelson, for instance, has succeeded in making a comparison of the standard metre with a wave-length of cadmium light in which the error does not exceed about one part in two millions. Two masses may be compared with even greater accuracy. See Everett's *Units and Physical Constants*.

Mecca (*mek'ă*), the holy city of the Moslems, is one of the oldest cities and the capital of Arabia. It is built in a narrow valley, surrounded by hills, which are crossed by two passes. The place is so secluded that the city is only seen when the traveler comes close upon it. It commands the principal caravan routes, and so became early a center of trade. The city is mainly modern, as the ancient buildings have been mostly destroyed by mountain torrents. The streets, unpaved and dirty, are broad, while the houses of stone, three and four stories high, climb the mountain sides. There is no drainage, and provisions of all kinds have to be brought into the city, owing to the barrenness of the soil. The population numbers about 60,000, who live upon the pilgrims who flock to the city, and upon the manufacture of sacred relics. What gave Mecca its first reputation as a holy city is uncertain, though it is probably the possession of the Black Stone, or fetish of the Kaaba, which attracted pilgrims ages before the time of Mohammed. This Black Stone is a small meteoric substance, and is built into the southeast corner on the outside of the temple, or Kaaba. There is another sacred stone, called the Southern Stone. The Moslems changed the idol temple with its heathen fetish, to a temple built by Abraham when he cast out Ishmael. The temple of Mecca, or the Great Mosque, is an open court surrounding the Kaaba, and has nineteen gates, with seven minarets, and holds 35,000 persons. The pilgrims walk around the Kaaba seven times, kiss the Black Stone, and touch the Southern Stone, and pass around a small inclosure containing the supposed graves of Hagar and Ishmael. The Kaaba is covered with rich hangings, presented by the Sultan of Turkey; has a door of silver and gilt, which is seldom opened to display the rich silver, marble, and silk decorations of the interior. It is about 70 feet long, about 50 feet wide, and nearly 40 feet in height. Every Mohammedan, whose means or health will permit, is obliged to make the pilgrimage to Mecca at least once. The Arabic word for a pilgrimage is hadj—and hence the Mohammedan who has made the journey to Mecca is called afterward a hadji or hadjji. Some who cannot make the journey themselves send some one in their place, but the honor and rewards of the deed do not belong to the substitute, but to his employer. The sacred well of Mecca may once have been a mineral spring, but its analysis now gives sewage matter as its principal element. The city was conquered by Mohammed in 627, five years after he had fled from it. The Carmathians sacked it in 930, carrying off the Black Stone and keeping it for twenty-two years. It belongs now to the Turkish empire (it passed to the Turks in 1517), though the real governor is the sherif or the reputed head of the descendants of Mohammed. See Burkhardt's *Travels in Arabia; Mahomet*, by Washington Irving.

Mechanics (*me-kăn'iks*) is a word employed with two distinct meanings. Sometimes it is used to denote the science of Matter and Energy, more properly called *Dynamics;* and sometimes it is employed to denote the application of dynamical principles to the theory of structures and to the theory of machines. Used in this latter sense, it is a branch of engineering and might more properly be called *Applied Mechanics*. At other times, Mechanics is used in a mixed sense to include both a discussion of Dynamics and the application of dynamical principles to structures and machines.

For a treatment of *pure* mechanics the reader is referred to DYNAMICS. For applied mechanics see BRIDGE, STEAM ENGINE, PUMP, LEVER, PULLEY, etc.

On pure mechanics — dynamics — see Minchin's *Treatise on Statics*, Tait and Steele's *Dynamics of a Particle*, and Thomson and Tait's *Treatise on Natural Philosophy*. Slate's *Mechanics* gives an excellent elementary résumé of the subject. Worthington's *Dynamics of Rotation* is still more elementary. For the applications of mechanics see Church's *Mechanics of Engineering*, Johnson's *Materials of Construction;* and Ewing's *Strength of Materials*. For the history of the subject, see Mach's *Science of Mechanics*, or Whewell's *History of the Inductive Sciences*.

Mechlin (*mek'lin*) or **Malines**, a city of Belgium, thirteen miles northeast of Brussels. It is a railroad center, and has manufactories of woolen, linen, lace, and beer. The Mechlin lace, so well known, is made here, but the trade is much less than formerly, and the quality of the lace now made is below the former standard. It is a picturesque city, with fine public buildings, among which are the cathedral, several large churches, the bishop's palace, widows' asylum, and the college. In the public square, or Grande Place, is a statue of Margaret of Austria, and some paintings of Rubens and Vandyke are to be found in the churches. Population 55,530.

Medes (*mēdz*), the people of Media, the ancient name for northwestern Persia. The inhabitants, called Medes, were an Aryan race. They were followers of Zoroaster, and their priests were the Magi. They were bold and warlike, skillful in the use of the bow, and noted horsemen. They were partly subject to Assyria until about 700 B. C., when they had a chief, with his capital at Ecbatana, now Hamadan. With the aid of the conquered Persians, and the king of Babylon, Cyaxares, the third king, or, according to some authorities the first, captured Nineveh, and overthrew the Assyrian empire, about 607 B. C. An eclipse, foretold by Thales, May 28, 585 B. C., stopped the career of conquest by frightening both parties into peace. In 550 B. C., the Persians under Cyrus revolted, and overthrew the Median king, Astyages, and the two nations became one people, and are spoken of as the Medes and Persians. Ecbatana was made the summer residence of the kings of Persia. The kingdom was divided after the death of Alexander the Great, the northwestern part, called Media, being a separate province, while the rest of the country, known as Great Media, belonged to Syria. Mithridates I. took Great Media in 147 B. C. from Syria and attached it to Parthia. Mark Antony fought a disastrous campaign against it about 36 B. C., when it seems to have had a king of its own. Media was finally again united with Persia, and her later history is that of Persia. See *Five Great Monarchies of the Ancient Eastern World*, by Rawlinson; *Races of The Old Testament*, by Sayce; and *Media, Babylon, and Persia*, by Miss Ragozin, in *Stories of the Nations*.

Med'ford, Mass., an old city of Middlesex county, on the Mystic river, and the Boston and Maine railroad, five miles northwest of Boston. It is also connected with Boston by electric railway. Here is the seat of Tufts college, belonging to the Universalist denomination. Its manufactures embrace felt boots, pressed and face brick, and print and dye works, paper mills, carriage factories, and brass foundries. It also manufactures crackers and rum. The city dates from 1630, but was organized as a city only in 1892. Population 18,244.

Medici (*med' ē-chē*), a celebrated Italian family in Florence and Tuscany, who attained sovereign power in the 15th century, and were great patrons of art and letters, as well as noted statesmen.

Med'ici, Lorenzo de, the Magnificent, was born of a wealthy Florentine family Jan. 1, 1448. He was highly educated and early showed his great abilities. On the death of his father, Pietro I., Lorenzo with his brother, Giuliano, were recognized as rulers. The great power of the Medici roused the envy of other Florentine families, and in 1478 they, in league with the pope, Sixtus IV., plotted to overthrow them. Giuliano became the victim of the assassin, but Lorenzo defended himself with such courage and vigor and diplomacy as finally to put down the conspiracy, in spite of the papal bull and the aid of the king of Naples. Innocent VIII., the successor of Sixtus IV., became the friend of the Medici family, and opened to them many of the positions of power which they filled. Lorenzo was a patron of art and literature, and himself a distinguished poet. He established a printing press at Florence and the University of Pisa, and enlarged the library founded by his grandfather, Corimo. He governed the state well, but made everything yield to the advancement of his family, and so left Florence weakened and ready to be the prey of her enemies. He died April 8, 1492. See *Life* by Roscoe; *Poetry and Poets of Europe*, by Longfellow; *Lives of Italian Poets*, by Stebbing.

Medi'na, Arabic for "the city," is, next to Mecca, the holiest city of the Mohammedans, because it was the home of Mohammed after his flight from Mecca. It is situated in western Arabia, about 270 miles north of Mecca. About half as large as Mecca, it is inclosed by a wall from 35 to 40 feet in height, with thirty towers, and a castle with a Turkish garrison, making it one of the strongest fortified places in that part of Arabia. The present population, of about 46,000, live by agriculture, and the alms or spoils of the pilgrims, who flock there as to Mecca, but at no particular time. The prophet's mosque is thought to be built on the spot where Mohammed died, and to

surround his tomb. It is smaller than the temple at Mecca, and has been rebuilt several times. The sepulchre, in the southeast corner, is an irregular chamber, from 50 to 55 feet in height, with a large gilt crescent above. Within, costly curtains, embroidered with gilt letters, cover a square building of black marble, where the prophet's body is believed to lie undecayed, with the face toward Mecca. No European has ever been allowed to see the coffin, which is cased with silver, and covered with a marble slab; but there seems no reason to doubt that it is really the burial-place of Mohammed. The city was once famed for its scholars and theologians, and in the 7th century, was the capital of Islam.

Med'iterra'nean Sea is the largest inclosed sea in the world. It is connected with the open ocean (the Atlantic) only by the narrow strait of Gibraltar, nine miles wide. The name is derived owing to its being in the midst of the three continents, Europe, Asia, and Africa. It is 2,200 miles long, varies from 500 to 100 miles in width, and has an area of 900,000 square miles. It is connected with *the Black* sea by the Dardanelles, sea of Marmora, and the Bosphorus. The coasts of *Europe* and Asia Minor have many bays and gulfs, while the coast of Africa is even, with few indentations. The Tyrrhenian, Ionian, Iberian, Ægean seas, and the Levant are names by which the different parts of the Mediterranean have been known. Sardinia, Corsica, Sicily, Malta, Cyprus, and Crete are among the larger islands. The region is subject to earthquakes, and Vesuvius, Stromboli, and Ætna are its most famous volcanoes. The bottom of the sea is divided into two parts by a ridge which crosses it from Sicily to Africa, the water being deepest in the eastern basin. The evaporation from the surface is greater than the amount of water poured into it by the rivers flowing into it, and if it were not for the water of the Atlantic ocean, which flows in at the strait of Gibraltar, above the outflow of the heavier water of the Mediterranean, the sea would become salter and shrink into two salt lakes, like the Dead sea. There are also two currents at the entrance of the Black sea, as of the Atlantic, an inflow of fresh water from the Black sea, and an outflow of salt water from the Mediterranean. The Suez canal now connects the Mediterranean with the Red sea. The chief rivers that flow into it are the Rhône, the Po, and the Nile. The countries bordering the Mediterranean, Phœnecia, Greece, and Italy, have been the cradle of civilization, and the sea is well known in history and poetry and ancient story, and is to-day one of the most important water routes of the world.

Medulla Oblongata (*mē-dŭl'lo ŏb-lon-gä'ta*), the part of the hind-brain merging into the spinal cord, the hind-brain being made up of the cerebellum and the medulla oblongata. It is a very important part of the brain. The cranial nerves, with the exception of the optic and olfactory nerves, are connected with it, and in it are also located clusters of nerve cells — or especial centers — that preside over special actions. Here are located, for example, the respiratory center, controlling the respiratory movements; the cardiac center, for regulating the action of the heart; the vaso-motor center, for regulating the calibre of the blood vessels; the sneezing center and others. These centers may be excited to greater activity or held in check (inhibited) by various forms of stimulation from the external world or from within the body. See BRAIN.

Medusa (*me-dō'sä*), in Greek mythology, one of three sisters called the Gorgons. They had but one eye among them, a fortunate circumstance, as whoever they looked on was changed to stone. Medusa is represented in art as a winged virgin, with hissing snakes for hair, brazen claws, and a single tusk for a tooth. They kept the garden of the Hesperides, where Medusa was slain by Perseus.

Medusæ (*mē-dō'sē*), a group of free swimming jellyfish. They have a dome-shaped or umbrella-shaped swimming disc of jelly-like consistency. From the margin of the disc hang many tentacles, which, from their fancied resemblance to the snaky locks of Medusa, the gorgon, gave these animals their name. In many cases the medusæ are modified polyps, set free from branching colonies of hydroids. Those derived in this way are called medusoids, and they carry the reproductive elements of the forms from which they are set free. In this variety, the opening into the swimming bell is partially closed by a circular membrane, and they are called crespadote medusæ. Other medusæ have usually a larger and more flattened disc and lack the membrane (acrespadote). They have also certain other technical peculiarities. See CŒLENTERATA, HYDROZOA, and JELLYFISH.

Meerschaum (*mēr'shawm*), is a mineral, found in several parts of the world, consisting of hydrous magnesium silicate. It is a white clay-like substance, which, when dry, will float on water: hence its name, which means sea-foam. When first dug from the earth it is soft, like soap, makes a lather in water, and takes out grease, and is often used instead of soap by the Turks. In Europe, it is found in Moravia, Spain, and the Crimea, and in Turkey in Asia there are large beds of it just below the soil. It is also found in South Carolina. Its use is almost entirely for the manufacture of tobacco pipes, the Austrians being most largely engaged in the trade. The pipes made at Vienna are often worth $500, from the great beauty of their design. The waste material left after cutting the pipes is ground into powder, and mixed into a paste, from which the cheaper pipes are made.

Megaphone (*mĕg'a-fōn*), a large funnel-shaped tube used for reflecting sound. A tube of this kind may be used either to receive sound, when it becomes an "ear trumpet," or it may be used to transmit sound, in which case it becomes a "speaking trumpet." The principle of the megaphone is exactly the same as that employed in the headlight of a locomotive, where the light waves are reflected and sent out in a more or less parallel beam along the track. The only difference is that, in the megaphone, sound waves, and not light waves, are reflected.

The two principal uses of the megaphone at present are, *first*, to transmit the sound of a phonograph in the direction desired, and *second*, to transmit the human voice to a long distance, or to a large audience, as at horse-races and ball games.

Megasporangium (*mĕg'a-spō-răn'jĭ-ŭm*) (in plants), the sporangium which produces megaspores. In pteridophytes (fern-plants), they are produced by the water-ferns, selaginella and isoetes; while in all seed-plants (spermatophytes) the so-called "ovules" are megasporangia, sometimes called "macrosporangium." See HETEROSPORY.

Megaspore (*mĕg'a-spōre*) (in plants). In cases of heterospory (which see), the large asexual spores are called "megaspores," sometimes "macrospores." In germination a megaspore produces a female gametophyte, that is, one which bears the eggs. Megaspores are found in a few pteridophytes, and in all spermatophytes. In the latter group but a single megaspore is produced by the megasporangium (ovule), and is not shed, often being called the "embryo-sac." It is this single retained megaspore which results in the formation of a seed by the ovule. See HETEROSPORY.

Megasporophyll (*mĕg'a-spōr'ō-fĭl*) (in plants), the sporophyll which bears megasporangia, sometimes called "macrosporophyll." Megasporophylls are chiefly developed in seed-plants, and in the angiosperms (true flowering plants); they have been called "carpels," the innermost organs of flowers. See HETEROSPORY.

Meissonier (*mā'sō'nē-ā'*), **Jean Louis Ernest**, a French artist, was born at Lyons, Feb. 21, 1815, in great poverty. As a youth he painted several early pieces which he sold at one dollar the square yard. When nineteen years of age he succeeded in getting to Paris, where he was soon admitted to the studio of Leon Cogniet, by whom his ability was soon recognized. His distinctive excellence in small paintings finished with exquisite precision was soon developed, and many of his most celebrated pieces are but a few inches in height or breadth. His first public exhibition occurred in 1834. From that time he was popular and prosperous. In 1843, he won his earliest first-class medal, and in 1846 he received the decoration of the Legion of Honor. In 1861, he became a member of the Institute. No one has excelled, few have ever approached, him, in his chosen field. Nearly all of his pieces have to do with the military, and his masterpiece, *Friedland — 1807*, one of the largest, by the way, he ever painted, was brought to New York and is now in the Metropolitan museum of that city. He died at Paris, Jan. 31, 1891. See *Life*, by Mollet.

Melanchthon (*me-lank'thon*), **Philip**, a German reformer and friend of Luther, was born Feb. 16, 1497, at Bretten, in Baden, Germany. Melanchthon is the Greek form of his German name, Schwarzerd. He studied at Heidelberg and Tübingen. He lectured on the philosophy of Aristotle in 1514, and soon after published a Greek grammar. His appointment to a Greek professorship at Wittenberg in 1518 brought him into contact with Luther. He threw himself at once into the work of the Reformation, bringing to it an extent of learning nearly equal to that of Erasmus, and a gift of clear thinking and expression unequaled among his fellow workers. His influence was in favor of peace and moderation, which, although he carried it to such an extent as to lose in some degree the confidence of the Protestant party, did much to preserve the reformation from excesses which would have hindered its progress. The first great Protestant work on theology was written by him and published in 1521, going through more than fifty editions in his lifetime. In 1530, he published his defense of what is known as the Augsburg confession of faith, the foundation of the Protestant religion in Germany, which confession had been prepared by him and submitted to the assembly of German princes at Augsburg. Melanchthon's works are very numerous, including commentaries on parts of the Bible and classical works, books of doctrine and moral philosophy, and a large correspondence with the leading men of the age. He ranks among the highest names in the history of learning and education. He died at Wittenberg, April 19, 1560. See *Life*, by Cox; *History of the Reformation*, by D'Aubigne.

Melbourne (*mel'burn*), the most important city of Australia, the capital of the colony of Victoria, is situated at the northern end of Port Philip bay on both sides of the river Yarra. Its streets are wide, crossing each other at right angles, with a great many fine buildings. It is the center of the railroads of Victoria, and has numerous factories, foundries, and flour-mills. Its university, with three colleges, and a workingmen's college, are the principal educational institutions. The exhibition building, post office, law courts, the houses of parliament, costing $5,000,000, the royal mint, custom-house, and the treasury are among the fine public edifices. The growth of Melbourne has been very rapid. It was

first occupied by white men in 1835. In 1851, at the time of the discovery of gold in Victoria, it had a population of 25,000. In 1899, it numbered 480,000, including the suburbs. In 1888, an international exhibition was held on the hundredth anniversary of the settlement of Australia, which cost the colony $1,000,000. Melbourne was, in 1901, visited by the duke of Cornwall (heir apparent to the English crown), and his consort, on the occasion of the opening of the first parliament of Federated Australia. See *Victoria and its Metropolis*, by Lord Melbourne.

Melchizedek (*mel-kĭz'ē-dĕk*) ("king of righteousness"), a Bible character called king of Salem and priest. Salem is thought to be a poetical name for Jerusalem. According to the story in Genesis, this king met Abraham on his return from a victorious expedition, and blessed him, and Abraham gave him a tenth of the spoils he had taken. There are two other allusions to him in the Bible, one in Psalms cx., where his priesthood is referred to, and again in Hebrews vi. and vii., where he is used as a type of Christ.

Melegnano (*mā-lĕn-yä'nō*), formerly called Marignano, a town of Italy, on the Lambro, nine miles south of Milan. It is noted as the scene of a battle between France and the Swiss troops under the duke of Milan, in 1515, where Francis I. was the victor. It was called the "battle of the giants." In June, 1859, a French force routed the rearguard of the Austrian army at the same place. Population 5,438.

Melo'deon, a musical instrument somewhat like a piano in appearance, but depending upon a bellows and reeds for producing the musical sounds. It was manufactured in the United States, over 20,000 being made in 1859, but is now superseded by the cabinet organ, which is somewhat like the melodeon, with many and great improvements.

Mel'on, the general name most commonly associated with muskmelons and watermelons, and sometimes extended to include gourd fruits in general. See MUSKMELON, and WATERMELON.

Mel'rose Ab'bey, a celebrated abbey in Roxburghshire, Scotland, situated near the town of Melrose, on the river Tweed, 30 miles from Edinburgh. It was built in 1136 by David I. of Scotland, was twice burned by the English, rebuilt in greater splendor, only to be again destroyed by English invasions. It is, even in ruins, one of the finest examples of Gothic architecture, and in its prime was the most beautiful building in Scotland. The abbey has been made celebrated by the writings of Sir Walter Scott, whose seat, Abbotsford, is in the vicinity, and is visited by many tourists. See *The Abbot*, and *Lay of the Last Minstrel*, by Scott.

Mel'rose, Mass., a city of Middlesex county, eight miles north of Boston, on the Boston & Maine railroad. It is a growing town and possesses a number of schools, churches, public parks, halls, and library, together with several banks, hotels, and club-houses. Its industries include the manufacture of boots and shoes, furniture, silver polish, sewing-machine needles, etc. Population 12,962.

Mel'ville, George W., an American engineer, was born at New York, Jan. 10, 1841. He was educated at the Brooklyn Polytechnic, and entered the United States navy July 29, 1861, as third assistant engineer. He became engineer-in-chief of the navy in 1887, and rear-admiral in 1899. He personally contributed not a little to the building up of the new American navy by various inventions. During his term 120 ships with a combined force of 700,000 horse power were constructed under his supervision. In 1879 he joined the Arctic expedition under command of Lieutenant DeLong, and commanded the boat's crew which escaped from the delta of the Lena. He afterward recovered the records of the expedition and recovered also the remains of the unfortunate party which perished on the shores of Siberia. He received a gold medal by special act of congress for his bravery and success in this.

Mem'non, one of the heroes of the Trojan war, was, in Greek mythology, the son of Aurora. He led a band of Ethiopians to the aid of Troy, slew Antilochus in single combat, and was himself slain by Achilles. Two famous statues were discovered by the Greeks at Thebes, and one of them was supposed to be that of Memnon, though more probably that of an Egyptian king. It is one of the "seven wonders of the world," is about 60 feet high, and gave out a sound like the snapping of a chord, about sunrise. The Greeks called it "the voice of Memnon hailing his mother, Aurora" (the dawn). It was visited by many travelers until the time of the Emperor Severus, when it became silent, and it is inscribed with the names of many celebrated

visitors. The origin of the sound is a matter of conjecture, though it has had several explanations. See *Edinburgh Review*, July, 1886.

Mem'phis (*mem'fis*), the well-known city of Egypt, was the ancient capital of the country. It is situated on the Nile, ten miles south of Cairo. The city was founded by the first Egyptian king, who changed the bed of the Nile, and built an embankment to protect the new city, the remains of which are still to be found. It was a large city, about seventeen miles in circuit, according to some writers, having communication with both the Mediterranean and the Red sea. It had a large trade, and was the seat of learning and religion. It was the capital of Egypt for nearly a thousand years. It was conquered by Sennacherib and by the Persians; Alexander the Great worshiped at the shrine of the sacred bull, and the first Ptolemies were crowned in its temples. Ptolemy VIII. destroyed the city, and it fell with the rest of Egypt under the Roman power. Its temples were magnificent, including the temple of Isis, the temple of the Apis, that of Ptah, where was kept the sacred bull, and that of Serapis, where was a nilometer to record the floods of the Nile. Most remarkable of all the ruins of Memphis are the pyramids, including the great pyramid of Cheops and the statue of the Sphinx. Memphis remained the chief city of Egypt until Alexandria was built, when it fell into ruins, and for a long time even its site was unknown. The village of Mitrahenny now marks the spot, and the ruins of temples and palaces and statues cover hundreds of acres. See *Story of Ancient Egypt*, by Rawlinson; *Egypt from 4400 B. C.*, by Clement.

Mem'phis, a city of Tennessee, in Shelby county, is built on a bluff, 35 feet above high water, on the Mississippi river. Its river and railroad communications bring it a very large trade. It is one of the largest cotton markets in the country, and has numerous foundries and machine shops, and some of the largest oil mills in the United States, producing over $1,000,000 worth of cotton-seed oil a year. It has a large lumber trade, with 1,000 lumber mills in the region. It is a handsome city, with many fine public buildings, including a custom-house, cotton exchange, Roman Catholic college, large hospitals, and theatres. An epidemic of yellow fever in 1878 and 1879 destroyed nearly 10,000 inhabitants; since then a new system of drainage has been introduced, making it one of the healthiest cities of the country. Population 102,320.

Memphremagog (*mem-fre-ma'gog*), **Lake,** on the northern border of Vermont, adjoining the Canadian province of Quebec, is about 35 miles long and from two to five miles wide. It has many islands and an abundant supply of fish. Owl's Head and Sugar Loaf are mountains on the western shore, and the whole region is very picturesque.

Menai Strait (*men'i* or *men'ā*), a channel separating the island of Anglesea from Wales. It is 14 miles long and from 200 yards to two miles wide. The navigation is difficult, but the passage is much used, as it saves time. The channel is crossed by a suspension bridge, built in 1825, and by the famous Britannia bridge, built in 1850. This is a tubular iron bridge, used for railroads.

Mendelssohn-Bartholdy, Felix, the composer, was born at Hamburg, Germany, Feb. 3, 1809. The name was already famous through his grandfather, Moses Mendelssohn, the philosopher, but his father determined to bring up his children as Christians, and added Bartholdy to the name to distinguish them from the Jewish branch of the family. At eight years of age, Mendelssohn studied music, and two years later appeared in a concert in Berlin. In 1820, when only eleven years old, he began his work of musical composition, which ended only with his death. He made the acquaintance of all the great men of his day, such as Goethe, Weber, and Moscheles. His operas, *Camancho's Wedding*, and *Midsummer Night's Dream*, were published in 1825 and 1826; and in 1827 the first one was produced in Berlin. Though received with great applause, it was never repeated, and was severely criticised. He formed a choir for the study of Bach's Passion music, ending a famous performance in 1829. He visited England in April, 1829, making his first appearance in a concert of the Philharmonic society at London. He visited Munich, Vienna, Rome, and Paris before returning to Berlin. He spent two years at Dusseldorf, having charge of some musical and dramatical entertainments. Leipsic became his home in 1835, where he took charge of the Gewandhaus concerts, visiting England in 1837 and again in 1840, and Berlin for a year in 1841, at the command of the king. In England, he conducted his *St. Paul*, which was very popular, and in Berlin he composed the music of *Antigone* and *Œdipus*. His oratorio, *Elijah*, on which he spent nine years, was composed for the Birmingham festival and was brought out there in 1846. He was eminent not only as a composer, the list of his works being very large, but as a pianist and organist. He had also a gift for drawing and improvisation. He was always a great favorite with English audiences, his *Elijah* having retained its popularity for forty years. But his excessive labors brought on a brain trouble from which he died, Nov. 4, 1847, at his home at Leipsic. See *Letters; Life*, by Moscheles and Lampadius.

Mendez Pinto (*men'dēz pēn'to*), **Fernao,** was a Portuguese adventurer, born about 1510. He began his adventures by going as a volunteer against the Turks in the Indian ocean, and the Red sea, about 1537. In twenty-one years of service, shipwreck, and

encounters with pirates, he was thirteen times captured and seventeen times sold as a slave. He first saw Japan while in the service of a Chinese pirate, and on returning to Ningpo his stories of its wealth induced the Portuguese living there to fit out nine ships in fifteen days to visit the new country. The vessels were lost, however, and Pinto found his way back to China. He made three other visits to Japan, once in company with St. Francis Xavier, and once as ambassador from the Portuguese viceroy of India. His fortune, which was enormous, he devoted almost entirely to founding a Roman Catholic seminary in Japan. He wrote the story of his life, which was published in Lisbon, and is now accepted as true, though for many years it was thought to be greatly exaggerated. He died near Lisbon, July 8, 1583.

Men'dicant Orders. See DOMINICANS, and FRANCISCANS.

Menendez de Aviles (*mā-nān'dāth dā ā-vē'lās*), **Pedro,** a Spanish admiral, was born at Avilés, Asturias, in 1519. After many years of service under Charles V. and Philip II. against French corsairs, and as commander of the Indian fleet, he was appointed commander of Florida, with orders to found a Spanish colony. His fleet of thirty-four ships, with 2,646 colonists, sailed from Cadiz, Spain, June 29, 1565. In the meanwhile a French Huguenot colony had settled in Florida. Menendez surprised the French fort and massacred the people — "not as Frenchman, but as Lutherans." He established colonies at St. Augustine, which he named Cape Carnaveral, and Port Royal harbor, South Carolina, and explored the coast as far as Chesapeake bay. While absent in Spain, a French adventurer captured San Mateo, one of his forts, and avenged the massacre of the French Huguenots — "not as Spaniards, but as traitors, thieves, and murderers." On his return, in 1572, he in turn avenged the massacre, and then explored the whole coast, until recalled by the king to command a fleet getting ready to sail against the Low Countries. He died at Santander, Spain, Sept. 17, 1574.

Menha'den, the name of a fish, a species of herring or shad, very abundant off the eastern coast of the United States. It is called whitefish, bonyfish, hardhead, and mossbunker. They are taken in nets, sometimes as many as will fill 100 barrels in a night, and sold for food, bait, and manure. They are too oily to be much used for food, but make excellent manure. The oil is used in dressing leather. The business of catching these fish and manufacturing the oil and the fertilizers from them is very large and is carried on from Maine to New Jersey.

Mennonites (*mĕn'nŏn-īts*), a body of Christian believers, named after Menno Simons, a religious reformer of the 16th century. As a sect they seem first to have drawn together in Switzerland about 1525, although they claim to be descendants of the Waldensians. Menno himself was born at Friesland about 1492, being ordained to the priesthood in his native country and serving in the village of Pinjun. In 1536, he withdrew from the communion of the Roman church and identified himself with the Anabaptists, and became a bishop of their sect at Groeningen. After enduring considerable persecution he settled down in Oldesloe, in Holstein. He died in 1559. He taught the unlawfulness of oaths, of war, of members of the church becoming civil magistrates; and he enforced so strict a discipline as to disrupt his own church. He did not himself go to any of the fanatical lengths which made the name of Anabaptists so odious in Holland, but was of a gentle disposition, modest in his personal claims and pure in his personal life. William of Orange befriended the Mennonites and gave them certain liberties in Holland, which the states afterward withdrew. In 1786 Catharine II. of Russia invited the Mennonites, with other German emigrants, to settle in her dominions, and about 350 families made their homes in the lower province of the Dneiper. They were for a time liberally aided in money, and granted perpetual exemption from military service. The privileges extended to them drew a much larger number to their Russian home, and their towns increased in numbers and wealth. As late as 1861 the emperor, Alexander II., confirmed all their ancient privileges and exemptions, and granted new lands upon the Volga. But in 1871 a new policy of repression was introduced, and exemption from military duty was to be withdrawn after the expiration of ten years. The leaders of the sect began immediately to seek new homes for their people; and large colonies emigrated to the United States, whither smaller bodies had preceded them. The earlier comers for the most part settled in Pennsylvania; the later in the Dakotas. They are already divided into various minor sects, of which perhaps the *Amish* are most frequently mentioned on account of their peculiar abhorrence of buttons, using only hooks and eyes upon their heavier garments. The census of 1890 reported only 41,000 Mennonites in the states, although this number was divided into no less than twelve sects. As this people take little or no part in political affairs, and are averse to being numbered, it is probable that their membership is considerably larger than this, as has always been commonly believed. They are sometimes classed with the Baptists on account of their practice of immersion; and oftener with the Friends, on account of their abhorrence of war.

Menominee (*me-nŏm'ĭ-nē*), **Mich.,** capital of the county of the same name, situated at the mouth of the Menominee river, on Green Bay, at the extreme southern point of the northern peninsula of Mich. It is fifty miles

north of Green Bay city, Wis., and on the Chicago, Milwaukee, and St. Paul, and the Chicago and Northwestern railroads. It is conveniently situated as a lumber-shipping port, and has a number of sawmills and other industrial activities. It has also considerable trade in the vicinity in marble quarrying and iron mining. Population 12,818.

Menschikoff (*men'shĕ-kof*), **Prince Alexander Sergeivitch,** a prominent Russian general, was born in 1787. He served in the Russian campaigns of 1812 and 1815, rising to the rank of general. He was ambassador to Persia, and fought in the war against that country. He took Anapa, in the Turkish campaign of 1828, but was severely wounded before Varna. As head of the Russian navy he brought it to a high degree of perfection. His overbearing conduct while ambassador at Constantinople, in 1853, brought on trouble between Turkey and Russia, which ended in the Crimean war. In that war he commanded both the Russian land and naval forces, and though he lost the battles of Alma and Inkerman, he displayed great energy in the defense of Sebastopol. He was recalled because of a severe illness, and was, until his death in May, 1869, a prominent member of the old Russian party, and opposed to all reforms.

Mentone (*men-tō'nā*), a French seaport town, is situated on the Mediterranean, near the borders of Italy, 14 miles from Nice. On the north and west, the spurs of the Alps, 3,000 or 4,000 feet high, shelter it from the winter storms, so that the climate is mild, making it a favorite winter resort for invalids. It is surrounded by beautiful suburbs, and by olive groves and plantations of oranges and lemons. The trade of the region is largely in olive oil, lemons, oranges, and wine. At the eastern end of the bay are the bone-caves, about 88 feet above the Mediterranean in which many curious remains are found, belonging to prehistoric times. Mentone belonged to Monaco up to the year 1848, when the inhabitants put themselves under the protection of Sardinia. Twelve years later (1861) Sardinia ceded the town to France. Population about 10,000. See *Winter and Spring on the Shores of the Mediterranean*, by Bennet.

Men'tor, the son of Alcimus, the friend of Ulysses, to whose care that hero intrusted his son Telemachus when setting out for the Trojan war. On account of the fidelity with which he discharged this trust, his name became a synonym for one chosen to be a guide or instructor of youth.

Mephistopheles (*mef-is-tof'e-lēs*), in old legends a character representing the principle of evil, or another name for the devil. The name is thought to be derived from the Hebrew, and means "one who loves not light." The character is best known from its appearance in Goethe's *Faust*.

Mercator (*mer-kā'tor*), **Gerard,** a Flemish geographer of the 16th century, was born at Rupelmonde, Flanders, March 5, 1512, his real name being Kræmer, "merchant," of which Mercator is the Latinized form. He took his degree as bachelor of philosophy at Louvain, but devoted his later years to the study of geography. In 1559, he was appointed cosmographer to the duke of Cleves. He published several important works, including maps and descriptions of France, Germany, and Great Britain. He did a great deal to put geographical science upon a secure footing and to make popular the researches of the learned. Some of his later works were of a religious character and were supposed to favor the Reformed doctrines. He died in Prussia, Dec. 2, 1594.

Merca'tor's Projec'tion is a name given to that kind of map-making in which the meridians of longitude are drawn as if parallel, the circles of latitude being in consequence all at right angles with the same. In order to lay down the sailing course of a vessel, which is in fact a curve, so that it shall be represented as a straight line, and the angle of the course be readily measured upon the chart, it is necessary to represent the surface of the earth as a plane instead of spherical. This requires, of course, that the degrees of longitude, which vanish at the poles, should be represented as the same length that they are at the equator. In order to draw a chart upon which all sailing courses may be represented by straight lines, sea-maps are constructed according to the scale devised by Mercator, the distances as we go toward the pole being immensely exaggerated. The amount of these exaggerations are taken from a table of meridional parts. Given then the starting point of a ship and its meridian and latitude at the close of the day, a straight line between these two points found upon a Mercator's chart would indicate its course, and lines drawn parallel with the meridian passing through the termination and one parallel with the latitude of the starting point would form at their junction a right angle. The angle of the course sailed would be found by measuring the angle at the base.

Mer'cury or **Hermes,** in Greek mythology, the son of Zeus and the messenger of the gods. He was the patron of the thieves, of travelers of merchants, of rain, of good fortune, and of eloquence, and is sometimes called the god of the wind. He began his career by stealing the oxen of Apollo when only a few hours old, and inventing a lyre out of a tortoise shell at the same early age. He was connected with the every-day life of the Greeks more than any other god. His images were found on mountains, by streams, in the streets of their cities, over the doors of their gymnasiums, and were used as guide-posts on their roads and to mark the boundaries of their states. He is represented in art

with a staff, wings on his feet or shoulders, and a low, broad-brimmed hat on his head. Some of the most beautiful specimens of Greek art are statues of Hermes, notably one by Praxiteles. Mercury is the Latin name for the Greek god Hermes.

Mer'cury or **Quick'silver** is the only metal that is fluid at common temperatures, which gives it its name, meaning fluid silver. It is of a silvery-white color, and runs on a smooth surface, in separate round drops. If it is not pure, the drops will leave a trail. Heat expands it, and cold contracts it regularly down to its freezing point, which is about 40° below 0°, which explains its use in a thermometer, the range being more than 700 degrees between the boiling and freezing points. When boiled, mercury forms an invisible vapor. Native mercury or quicksilver occurs in small quantities, usually in connection with mercurial ores. These ores, of which the most important is called cinnabar, are burned in a furnace, and the sulphur, which is combined with the mercury, passes off as sulphurous acid, and the mercury can be collected in a condensing chamber. The Greeks and Phœnicians procured cinnabar from Almaden, Spain. After the discovery of America, the mercury of Peru was famous. The larger part of the mercury used in America comes from California, and most of it from one mine, called the New Almaden. Mercury unites with other metals to form what are called amalgams, and this property is made use of in extracting gold and silver from their ores. The amalgam of mercury and tin is used in silvering mirrors, while others are used in gilding and filling teeth. It is used largely in the making of philosophical instruments and in the laboratory, and some salts of it are used in medicine and as antiseptics.

Mer'cury. See PLANET.

Mer de Glace (*mâr de glâs*), Switzerland, one of the most noted of Apline glaciers. At a distance, only a part of this vast "sea of ice," can be seen, but there are miles upon miles of pulverized rocks ground off from adjacent cliffs and piled up on its sides. Among these are bowlders 20 or 30 feet square, which have been tossed about like mere playthings and landed here. The "sea of ice" lies between these tracts of earth and stones, white and glistening, and looks as if its billows had been instantly frozen, while their crested waves were wildly tossing. Some of these are gigantic, for as the glacier pushes down toward the valley it is distorted into monstrous forms by various obstructions in its way. Some of these glistening waves are more huge than any cathedral built by man. As this frozen mass descends in the fertile valley, it steals between the pastures and close to the trees and hayfields of the meadows, so that one may swing a scythe or gather flowers only a hundred yards away from a deep crevasse, which is a death trap, swallowing its hapless victims every year.

Mer'edith, George, an English novelist and poet, was born in Hampshire, England, Feb. 12, 1828. His first writings were poems, published in 1851, followed in 1855 and 1857 by stories. The series of works for which he is best known began in 1859 with *The Ordeal of Richard Feverel.* Others of his best known works are *Rhoda Fleming*, *The Egoist*, *Adventures of Harry Richmond*, *Vittoria*, *The Tragic Comedians*, and *Diana of the Crossways*, the latter being deemed the most charming of his novels. His later poetry is in three small volumes, *Poems and Lyrics of the Joy of Earth* (1883), *Ballads and Poems of Tragic Life* (1887), and *A Reading of Earth* (1888). His later novels include *One of Our Conquerors*, *The Amazing Marriage*, *The Tale of Chloe*, and *Lord Ormont and His Aminta.* While not a popular writer (for his style is difficult), Meredith ranks among the foremost novelists of the day. See *George Meredith*, by Le Gallienne; *Some Characteristics*, by John Lane.

Merida (*mer'ē-dd*), a city of Mexico, the capital of Yucatan, is situated on the gulf of Mexico. It was founded by the Spaniards in 1542 on the site of an ancient city. It has a cathedral, finished in 1598, a university, conservatory of music, museum, and public library. Its manufactures are largely molasses, sugar, cigars and cigarettes, rum, leather, and soap. Population 36,935.

Mer'iden, a city of Connecticut, 19 miles north of New Haven. It was made a town in 1806 and a city in 1867. It is a manufacturing place, principally of metal wares, cutlery, firearms, carriages, and woolen goods. The Meriden Britannia company, founded in 1852, covers ten acres of floor space with its factories. It manufactures silver-plated ware and is the largest establishment of the kind in the world. Its well-known trade mark, "1847, Rogers Bros.—A1," is a guarantee of good material and honest work. Population 24,296.

Merid'ian, from *meridies*, midday, noon, is the name given to the great circle passing through the earth's surface and the celestial sphere, which passes through both poles of the heavens, and the zenith and nadir of any place on the earth's surface. Every place, on the earth's surface has, therefore, its own meridian. When the center of the sun comes upon the meridian of any place it is midday, or noon, there. And as it is midday at all places directly under that meridian, it is midnight at all places directly opposite upon the other side of the globe. All places under the same meridian have therefore the same longitude. Stars are measured as to their distance from the celestial meridian. In making a map some place is arbitrarily chosen, as Greenwich or Washington, from which longitude is computed by measuring the distances

in degrees of their meridians from each other. Since the vast development of railways in the United States it has become more and more important to have all watches mark the same time within certain geographical limits. In consequence, certain meridians have been chosen by the railway authorities as standards of time; and all watches between such meridians, one hour of the sun's journey, or part, are set alike. When the distance between two such standard meridians has been traversed, timepieces are reset so as take up or strike off an hour.

Meri'dian, Miss., a town in the cotton belt, the capital of Lauderdale county, in eastern central Mississippi, 85 miles east of Jackson, and 135 miles northwest of Mobile, Ala. It has a number of educational institutions, including the Meridian academy (Methodist Episcopal); Meridian Normal college; and East Mississippi Female college [Methodist (Southern) Episcopal]. Its commerce is chiefly in corn and cotton, and it has a number of industries, including steam corn mills, and establishments for the manufacture of cotton yarn, plows, doors, sashes, blinds, and general furniture. Population 14,050.

Meristem (*mĕr'ĭ-stĕm*) (in plants), young tissue whose cells are capable of division, which results in a multiplication of cells. The growing points of stems and roots consist of meristem or meristematic tissue, which produces all the tissues which appear in the mature stems and roots. The canbium (which see) in stems is a kind of meristem, which has the power of forming new wood on one side and new bast on the other. All growing organs are meristematic throughout or in some special part until they are fully grown. An appropriate phrase describing meristem is "formative tissue."

Mer'ivale, Charles, an English divine and historian, was born in Devonshire in 1808; and died Dec. 27, 1893. He was educated at Cambridge, where he became both fellow and tutor. He was the preacher for the university from 1838 to 1850, and delivered lectures there in 1861 and again in 1864. In 1869 he was appointed dean of Ely. His chief works are *Fall of the Roman Republic*, and *History of the Romans under the Empire*, in seven volumes. He has written also a *General History of Rome, Early Church History*, and *Contrast between Pagan and Christian Society*, with a translation of Homer's *Iliad*.

Mer'lin, an ancient British bard, prophet, and magician, who lived in the 6th century. He was the son of a Welsh princess, and is said to have had miraculous powers from his birth. There are many allusions to him in early English poetry and history; in Spenser's *Faerie Queene*, and later in Tennyson's *Idylls of the King*. A collection of his prophecies was printed in the 16th century in French, English, and Latin.

Mer'maids, in popular legend, a class of beings part woman and part fish. They live in the sea, but are represented often as seated on the rocks,—a lovely woman with a human head and body ending in a scaly fish's tail. She has long, beautiful hair, which she combs with one hand, holding the mirror above the waves with the other. They sometimes seem to have exercised a special care of individuals, and often revealed future events. There are stories of their falling in love with men and remaining faithful wives and mothers for a long season, until they found a chance of returning to the sea, and also of enticing their lovers to their ocean homes. The beautiful romance of *Undine* and the story of Melusine are founded on the ancient belief in mermaids. See *Popular Myths of the Middle Ages*, by Baring-Gould.

Merovingians (*mer-ō-vin'jĭ-anz*), the first dynasty of Frankish kings in Gaul. The name was derived from Merwig, or Merovech, king of the western Franks who ruled from 448 to 457. Clovis, the first Christian monarch of the Franks, and Dagobert, are the names best known in history. The dynasty ended with Childerick III., 742–752, who was deposed by Pepin the Short, who founded the Carlovingian dynasty. See *History of France*, by Yonge; *Franks, to the Death of Pepin*, by Perry.

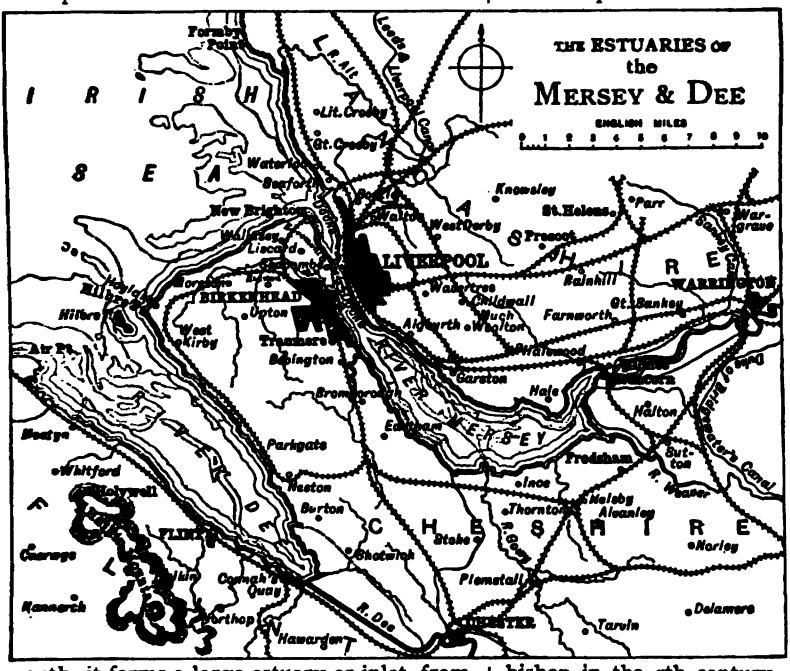
Mer'rimac, a river of New Hampshire, formed by the union of the Pemigewasset and Winnepiseogee rivers at Franklin, New Hampshire. It flows south into Massachusetts, emptying into the Atlantic ocean near Newburyport. Its numerous falls give a great water-power, which has made the manufacturing towns of Nashua and Manchester, New Hampshire, and Lowell and Lawrence, in Massachusetts. It is navigable for 18 miles to Haverhill.

Mer'ritt, Wesley, an American soldier, a major-general in the United States army, was born at New York, June 16, 1836, and graduated from West Point in 1860. Going into service as a second-lieutenant of cavalry, he was promoted to a first-lieutenancy in the infantry in the next year, and made a captain in the year following. At the close of the war he held a commission as lieutenant-colonel in the regular army and was a brevet major-general of volunteers. Since the close of the Civil war he was promoted in regular order of service through successive grades until he was made major-general U. S. A. He commanded a cavalry division in the Shenandoah campaign and rendered conspicuous service at Five Forks, Gettysburg,

GEN. W. MERRITT.

Fisher's Hill, etc. He was one of the three commanders chosen from the Federal army to arrange terms of surrender on the part of the Confederate army of Northern Virginia. After years of service in Indian campaigns in the territories of the west, he was assigned, May, 1898, to the command of the United States forces in the Philippines.

Mersey (*mer'zi*), an important river of England, flowing into the Irish sea, near Liverpool. About seventeen miles from its



mouth, it forms a large estuary or inlet, from two to three miles wide. The river has been made navigable from Liverpool to Manchester, by a ship canal, while a railroad tunnel, connecting Liverpool and Birkenhead, passes under it. The country along its banks is very fertile, and by walls along parts of the river that were subject to overflow, many thousand acres have been reclaimed. The river is 70 miles long.

Merthyr-Tydvil (*mer'ther-tid'vil*), a market town in Glamorganshire, on the river Taff, South Wales, 24 miles north of Cardiff. It is in the mining region of South Wales and is built largely on a foundation of slag—the refuse of the neighboring mines. It was originally made up of houses for the workmen in the mines and collieries, but has lately been very much improved, the streets being widened, pure water and good sewerage introduced, and one of the finest and largest market-places in Wales established in the center of the town. The business of the place is all connected with the iron and steel works and collieries. The name comes from the martyrdom here of a Welsh princess, named Tydvil or Tydfil. Population 60,861.

Merv, an oasis in Turkestan, Central Asia, near the northeast corner of Persia. It is sixty miles long and forty wide, and crossed by the river Murghab; its area being 1,600 square miles. It has a hot, dry climate and produces wheat, sugar, cotton, and silk. About a quarter million of Turkomans live in the oasis, where there is also a town called Merv, and a Russian fort opposite, with a garrison of 3,000 men. The men are workers in silver, and breed horses, sheep, and camels, while the women weave silk and make carpets. The country is mentioned in the earliest writings of the Persians, and Alexander the Great built a town in it. The Parthians, Arabs, Turks, Mongols, Persians, Turkomans, and Russians have held it at different times. It was the seat of a Nestorian archbishop in the 5th century, of a Greek archbishop in the 14th, and in the 8th century was the headquarters of the "veiled prophet of Khorasan." The Russians, who have held it since 1883, have built a railroad across it from the Caspian sea to the Oxus river. The oasis is distant 200 miles from Herat. See *The Merv Oasis*, by O'Donovan.

Meshed (*mesh'ed*), (place of martyrdom), is the principal city of northeastern Persia. It is the capital of Khorasan, and the sacred city of the Shiites, a sect of Mohammedans, 100,000 pilgrims visiting it yearly. It is surrounded by a wall twelve miles long, above which shine, as the city is approached, the gilded dome and minarets of one of the most magnificent mosques of the east. There are also splendid sepulchres of Haroun-al-Raschid and Nadir Shah, and near by that of Firdusi, the Persian poet, another large mosque, several colleges and a palace. Rugs, carpets, velvets, swords, and silk and cotton goods are manufactured, and turquoise

jewelry from the turquoise mines of the region. Population 60,000. See *Persia*, by J. Bassett, and Benjamin's *Persia and the Persians*, in the "Story of the Nations" series.

Mes'mer, Friedrich Anton, a German physician, was born near Constance, Switzerland, May 23, 1733. He studied medicine at Vienna, and, when he took his degree, presented a paper in which he introduced tentatively his theory of animal magnetism. Studying the properties of the magnet still further, in 1772 he concluded that there was a power in the universe like magnetism, which exercises a secret influence on the human body, which he called animal magnetism, and which is also called mesmerism. In 1775, he published an account of his discovery, and in 1778 went to Paris, where he created a great sensation and received large sums of money. The French government offered him the use of a hospital and a pension of $4,000 yearly, if he would instruct three assistants in his new methods, but he refused to reveal his secret. The government appointed a commission in 1785 to investigate the system. This commission, composed of such men as Benjamin Franklin, Lavoisier, Bailly, etc., reported unfavorably, and he lost his pupils and a large practice, retiring to Switzerland, where he died at Baden, March 5, 1815. See *Mesmer the Magnetiser*, by P. Anderson-Graham.

Mesophyll (*mĕs'o-fĭl*), (in plants), the tissue of foliage leaves whose cells contain chloroplasts. As a consequence, the mesophyll is the essential working tissue of leaves, and gives to them their green color. It is bounded above and below by colorless epidermal layers, and is traversed by the vein system. See LEAF.

Mesophytes (*mĕs'o-fīts*), plants which live in conditions of medium moisture and fertile soil. They are distinguished in this regard from the hydrophytes or water plants, and the xerophytes or plants of dry soil and air. Mesophyte conditions are those which are best adapted to plants which man cultivates. In case an area is hydrophytic, it is drained and made mesophytic; in case it is xerophytic, it is irrigated and made mesophytic. In contrast with hydrophytes and xerophytes, the mesophytes are far richer in leaf forms. All of the societies which man has formed by his introduction of weeds and culture plants are mesophytic. Among the more conspicuous mesophyte societies the following may be mentioned: "arctic and alpine carpets," characteristic of high altitudes and latitudes, where the conditions forbid trees and shrubs or even tall herbs; "meadows," which are areas dominated by grasses, the prairies being the greatest of meadows; "thickets," composed of willow, alder, birch, etc., either pure or forming a jungle of mixed shrubs, brambles, and tall herbs; "deciduous forests," which are the pride of the temperate regions, rich in forms and leaf display, with autumnal coloration and annual fall of leaves; "rainy tropical forests," in the regions of trade winds, heavy rainfall, and great heat, where the world's vegetation reaches its culmination, and where dense growths are developed, composed of all sorts of trees, shrubs, and herbs bound together in an inextricable tangle of great vines.

Mesopotamia (*mes'ō-pō-tā'mi-ā*), a country of western Asia, lying between the Tigris and Euphrates rivers, whence its name, meaning "between the rivers." Its area is about 55,000 square miles, with a level surface and sandy soil, and when irrigated, as it was in ancient times, is very fertile. Bagdad (population 145,000) is its capital. Upper and Lower Mesopotamia to-day include not only the Turkish vilayet or province of Bagdad, but also Mossul and Bassora, with a total area of 100,205 square miles, and a population of 1,350,300. Since 1515, when it was conquered by the Turks, it has been neglected, and has become barren. The present population are Arabs and Kurds, who keep herds of camels, sheep, and goats, and raise wheat, barley, millet, cotton, tobacco, and hemp. Wild hogs, jackals, hyenas, and foxes abound, but the wild asses and lions of ancient times have disappeared. The country has belonged at different times to the Assyrians, Babylonians, Persians, Greeks, Romans, Arabs, and Turks, and has often been the battlefield of these great empires. Among the ancient cities of the region were Harran and Nineveh, and of modern ones are Mardin, Mosul, and Diarbekir. The excavations being made at Nineveh and other ancient ruins are adding much to the knowledge of the region and its early inhabitants.

Mesquite (*mĕs-kēt'*) (the *Prosopis Juliflora*) is a spiny shrub or small tree, found in Texas and throughout the semi-arid southwest, of the family *Leguminosae*. Its wood is hard and it affords good fuel in limited quantities, while its gum supplies a fair substitute for gum Arabic. The long pods offer a sweet, thick, and fairly palatable pulp. Bark and wood are used for tanning. The curly mesquite, or screw bean, is larger than the common mesquite, although scarcely large enough to be called a tree, growing in company with willows near springs of water. Its pods are from an inch to an inch and a half in length and twisted into a rigid cylinder. The beans are eaten by the Indians of the plains. Certain coarse grasses of the southwest are often called mesquite-grass. They are valuable to stock men, but of little value when cut.

Messina (*mĕs-sē'nā*), the sacred city and seaport of Sicily, lies on the western shore of the strait of Messina. The city rises from the sea in the shape of an amphitheatre, its white houses standing out in relief against a background of hills. The city, although ancient, has few antiquities, as it was overrun by armies, and nearly destroyed by an earth-

quake in 1783. It has one of the finest harbors in the world, which is entered yearly by nearly 3,500 vessels. The industries are the manufacture of linen, muslin, and silk goods, the working of coral, and making of fruit essences; the exports are largely fruits and articles made from fruit, such as olive oil, wine, and essences. There is a cathedral, erected first in 1098, and since rebuilt; a citadel built in 1680, and a university founded in 1549, with churches, colleges, and academies of art and science. The city was founded in 732 B. C., and the Carthaginians destroyed it in 396 B. C. After Carthage was conquered by the Romans, it belonged to the Roman empire, until the Saracens took it in the 9th century. They were expelled in the 11th century by the Normans; and from 1282 to 1713 the Spaniards held it. In 1743, the plague, and in 1783 the earthquake, completed its ruin. In 1848, it was bombarded by the Neapolitans, and in 1861 was the last place in Sicily to yield to Italy. Population 156,552.

Metabolism (*mē-tab'o-liz'm*) (in plants), a term covering all the chemical processes taking place in the living organism. Some of these processes are constructive, *i. e.*, the resulting substances are more complex than before; others are destructive, the resulting substances being simpler than before. Thus constructive metabolism occurs when a green leaf, acting on carbon dioxide and water under the influence of light, forms sugar, a complex food, and when by further changes this food is built up into living protoplasm. But in respiration protoplasm is decomposed, and carbon dioxide and water, with other less known products, are formed. This is destructive metabolism. The products of metabolism are so many as almost to defy enumeration. See, for example, the thousands in medicinal use described in the United States Pharmacopœia.

Metallurgy (*met'al-lur'jy*) is the science which deals with the extraction of metals from the ores in which they are found in mining. Some metals are found as such, and are then said to be free, native, or virgin metals. Gold and platinum usually occur free; silver, copper, and bismuth are often found so. The other metals, such as iron, lead, tin, zinc, nickel, mercury, antimony, and aluminum invariably, or almost invariably, occur "mineralized," that is, in combination with other elements as oxides, sulphides, sulphates, carbonates, silicates, chlorides, etc.

Ores, as they are found and mined, usually contain large quantities of worthless materials, called "gangue," consisting of common rocks and minerals. Such ores are often washed by various machines called jigs, vanners, etc., in order to separate or *concentrate* the valuable material. In this process the lighter gangue is carried away by water and the heavier valuable minerals are collected. It is usually necessary to crush the ore and sort it by sieves before the operation is carried out. Where free gold occurs in sand or gravel a simpler method of washing is used. A stream of water carries the material through a long trough or "sluice," the bottom of which is provided with grooves or "riffles" in which quicksilver (mercury) is placed. The heavy gold sinks to the bottom, and is there held by the mercury as an amalgam.

Treatment with mercury or *amalgamation* is often applied to compact ores of gold and silver in stamp mills, which consist of arrangements like mortars and pestles worked by machinery. The stamping is usually done in the presence of water, and as fast as the ore becomes fine enough it passes with water through screens and over copper plates covered with a layer of mercury where the valuable metals are caught. Mercury is also placed on plates within the mortar. Ores containing sulphides, tellurides, etc., require heating in contact with air, or *roasting*, to burn off sulphur and other impurities before they are treated by amalgamation. Common salt is usually added to silver ores of this kind before roasting.

Certain gold and silver ores are powdered and leached, or "lixiviated" with solutions of chemicals to dissolve out the precious metals. For instance, a weak solution of potassium cyanide is used to dissolve free gold in the *cyanide process*, and solution of sodium hyposulphite is employed to dissolve silver chloride from ores that have been roasted with salt.

The most important metallurgical process is *smelting*. In this operation the ore, often after it has been concentrated, and frequently after it has been roasted, is mixed with a *flux*, if necessary, and melted at a high temperature. The earthy materials of the ore with the flux form a fluid *slag*, while the action of the fuel, or other chemical action, produces a molten *metal* in some cases, or in other cases a fused mixture of sulphides, called *matte*, which is much richer than the original ore in the amount of valuable metal it contains. In iron smelting the ore, mixed with coke or coal as fuel and with limestone as flux, is fed in at the top of an enormous blast furnace, a structure somewhat like a barrel in shape, but more slender, and much narrower at the bottom than elsewhere. Hot air, forced in through pipes near the bottom of the furnace, burns the fuel and produces great heat. Metallic iron and slag are formed, and are allowed to flow out from time to time through holes near the bottom; the metal, being heavier, runs out through a hole that is lower than the one used for the slag. The metal is called pig iron, and is used in foundries for making articles of cast iron, as well as for making wrought iron and steel. See IRON, and STEEL.

Copper ores are smelted in blast furnaces that are much smaller than those used for

iron. They are also sometimes smelted in *reverberatory furnaces*, in which the heating is accomplished by the flame from a coal fire made in a separate compartment of the furnace or by means of gas. With certain copper ores, such as those containing the oxides or the carbonates, metallic copper may be the direct product of smelting, but the very common ores containing sulphides are at first smelted for copper matte, which consists chiefly of the sulphides of copper and iron. The metal is extracted from the matte by operations in which air at high temperatures burns out or oxidizes the sulphur and iron. When gold and silver are present in copper ores, the precious metals are found in the metallic copper produced from them, and are recovered by electrolytic refining, which consists in dissolving the metal and re-depositing it by means of an electric current acting in an appropriate solution. The gold and silver, and some other impurities, are left undissolved in a finely-divided condition.

Lead smelting is carried out both in reverberatory furnaces and in blast furnaces. When galena, lead sulphide, the most common lead ore, is obtained nearly pure, either directly from the mine or by concentration, it is frequently smelted by roasting it on the bed of a reverberatory furnace until it is partly changed to oxide and sulphate, then raising the heat to fusion and thus causing the oxidized part to act upon the remaining lead sulphide with the formation of metallic lead and sulphur dioxide gas. The smelting of lead ores in blast furnaces is carried out particularly for the sake of obtaining the silver that the ores usually contain, and also for obtaining the silver from ores containing little or no lead, which are purposely mixed with lead ores with this end in view. If a sufficient proportion of lead is produced, practically all the silver (and the gold also) in the ores goes into the lead. The greater part of the silver produced in the world is extracted by lead in this way. If the ores contain sulphides, they are roasted before they are smelted in the blast furnace. Coke is the usual fuel, and limestone and iron ore are generally used as fluxes. The silver which lead contains is usually extracted by dissolving small quantities of zinc in the hot, molten metal. As the metal cools, the zinc becomes solid, then it rises to the surface, bringing the silver with it, and is skimmed off.

The metal zinc cannot be obtained by ordinary smelting processes, because it boils and is vaporized at the temperature at which it is reduced to the metallic state. This metal is therefore obtained by first roasting the ore, if it is the usual sulphide, and then heating it with coal in retorts made of fire clay. The zinc distills off and is condensed and collected.

A distillation process is also used for obtaining the volatile metal mercury from its ores.

Aluminium is not reduced to the metallic state from its compounds by the ordinary smelting processes. The principal method of producing it consists in passing a powerful electric current through melted cryolite in which aluminium oxide is dissolved.

The processes used for obtaining several other metals are similar to those that have been mentioned.

Metallurgy is a very ancient art that has been gradually developed and improved during historical times, but the greatest improvements have been made during the past century, and they have been largely due to the assistance afforded by advancing knowledge of engineering and of chemical and physical sciences. HORACE L. WELLS.

Met'als. See GOLD, SILVER, LEAD, IRON, etc.

Meteorology (*mē'tē-ēr-ŏl'ō-jy*), the science which deals with the phenomena of the earth's atmosphere. These phenomena may be grouped under three different heads, namely, *aërial* phenomena, including winds, cyclones, etc.; *aqueous* phenomena, such as rain, fogs, clouds, etc.; and *luminous* phenomena, such as lightning, the aurora borealis, etc. This science, which is one of enormous importance to the human race, is universally recognized as yet in an embryonic state. For the various subjects ordinarily grouped under this head, the student is referred to numerous individual articles, such as FOG, CLOUD, CYCLONE, LIGHTNING, etc., scattered throughout this work.

Me'teors are small bodies traveling in large numbers and in many directions through space. They are known as aërolites, fireballs, and shooting stars, and may be seen every clear night, sometimes a few only, and at other times in showers. The whole number which the earth meets in one day's travel through space is estimated at 7,500,000, but as this large number weighs in all only 100 tons, many of the meteors must be very small. The air acts as a shield, and offers so much frictional resistance that the meteor generally burns up in the air. The aërolites are the large masses which actually fall to the earth. Some of them are of iron, some of stone, and some of stone and iron. When their fall is noted, there is always a noise, as of an explosion, and a cloud or smoke and a melting of the mass, at least on the surface, showing the action of heat. The iron is combined with nickel, cobalt, copper, etc., in a different way from any combination found on the earth, though no new element has been discovered. The falls of aërolites have been more numerous than might be supposed, the British Museum having over three hundred specimens of them.

The fireballs are brightly-shining bodies seen crossing the sky, and are considered to be aërolites before their explosion and fall. Many hundreds have been observed, Arago giving a list of over eight hundred. They are of all sizes, and travel about 26 miles a second. Shooting stars may be seen on

almost any evening, and if carefully watched will seem to come from the same point in the sky. These points are called *radiants*, and are named for the constellation in which they are found — as the Leonids, a group whose radiant is in the constellation Leo. When there is a meteoric shower, the earth is passing through a group or swarm of these meteors, which are also moving as the earth does, in an orbit of its own. The Leonids, which are seen in November, are calculated to move round the sun once in 33¼ years, the earth crossing their track every year, but only meeting the main swarm when it reaches the point of crossing at the same time as the earth. When this happens, there is a meteoric shower, such as took place Nov. 13, 1833, when the stars fell like snowflakes and fireballs darted back and forth, making the most wonderful display of the kind ever seen. Astronomers predicted another shower in 1866, and it came within a few hours of the time agreed upon. The latest investigations point to a common origin for these meteors and the comets, or rather indicate that meteoric swarms are composed of disintegrated comets. Besides the great November group, other groups are active in August, April, September, and October. See Young's *General Astronomy*.

Meth'uen, Paul Sanford (Baron, C.M.G), a lieutenant-general in the British army, who distinguished himself in the Boer war, was born in 1845, and entered the Scots guards as lieutenant in 1864. In 1873, he was sent on special service to the Gold Coast, and in the following year became brigade-major at Ashanti. In 1877, he acted as assistant military secretary to the English commander-in-chief in Ireland, and from 1877 to 1881 was military attaché at Berlin. For the next three years he was assistant quartermaster-general for the home district in Britain, commandant at headquarters in Egypt, and commander of Methuen's horse and the field force during the Bechuanaland expedition of 1884–85. In 1888, he was deputy adjutant-general in South Africa, and from 1892 to 1897 commanded the Home district. On the outbreak of the war with the Transvaal and Orange Free State, he was given command of the first division of the army corps, sustaining the severe defeat at Magersfontein, after several dearly-bought victories.

Metre (*mē'tĕr*), the standard of length employed by all civilized nations, except England and the United States. This standard was prepared by the government of France about the time of the French revolution, and was intended to be equal in length to one ten-millionth part of the earth's quadrant passing through Paris. This length was ruled on a bar of platinum and is correct, by definition, at °°C. It is known as the *mètre des archives*. More recently, an international commission has prepared copies of this metre on bars of a platinum-iridium alloy. These copies have been distributed to various nations, and constitute the national standards of length. The unit of length most universally employed in science, is one one-hundredth part of the distance between the two end rulings on the metre bar. This unit is known as the *centimetre*.

Metronome (*mĕt'rō-nōm*), an instrument for dividing or "beating" time, used chiefly in the study of music. As ordinarily constructed, it looks like an inverted pendulum swaying before a pyramid, the pendulum being moved by clockwork, and the motion retarded or accelerated by sliding up or down a metal weight appended to the wire. If this weight be near the point of suspension the motion will be rapid; if near the top, correspondingly slow.

Metternich (*met'ter-nik*), **Clemens Wenzel Nepomuk Lothar,** Prince, an Austrian statesman, was born at Coblentz, Prussia, May 15, 1773. He studied at Strasburg and Mainz (Mayence). He was first connected with the Austrian embassy at The Hague, and came into notice at the congress of Rastadt. He was appointed Austrian minister to Dresden when he was twenty-eight, and two years later became ambassador to Berlin, and after the peace of Presburg was sent as minister to the court of Napoleon. "You are very young to represent so powerful a monarchy," said Napoleon, when he presented himself. "Your majesty was not older at Austerlitz," he answered, showing in his answer the skill and knowledge of character which gave him power. He concluded the treaty of Fontainebleau in 1807, and in 1809 became minister of foreign affairs, and while in that position negotiated the marriage of Maria Louisa of Austria with the Emperor Napoleon. He was made a prince of the empire in 1813, and in 1821 became chancellor. The French revolution, in spite of his resistance, was felt at Vienna, and Metternich was compelled to flee to England, where he remained until 1851. After his return, he took no part in public affairs, and died at Vienna, June 11, 1859. In 1880–84, his *Memoirs* were published in eight volumes. See *Metternich*, by Malleson, in the "Statesmen" series.

Metz (*mets*), the capital and strongest fortified town of Lorraine, Alsace-Lorraine, Germany, on the Moselle river. It has a series of forts around it, which have been strengthened since the annexation of Lorraine to Germany. It has a fine cathedral founded in the 14th century, with a beautiful open spire, 363 feet high. The making of saddles, shoes, and tanning, are the manufactures of the town; and the trade is largely in wine, brandy, and preserved fruits. Metz was known to the Romans as Mettis, and became a free city under the Franks, and was famous for its commerce, and its literature

and art. In 1552, it was taken by the French, to whom it was formally ceded in 1648. In the Franco-Prussian war, of 1870, it was occupied by Bazaine, who, after a long siege, surrendered it to the German army and by the treaty of Frankfort it became a German city. The population is more than half Catholic, and has decreased by emigration into France since the annexation to Germany. Population 59,794.

Meuse (*mūz*), a river which rises in France, flows north to Belgium, and into Holland. Turning to the west it joins the Waal, one of the mouths of the Rhine, and becomes the river Maas. It soon divides again, one branch reaching the sea in two wide inlets, while the northern branch also divides and enters the sea through two channels called the Old and New Maas. Rotterdam stands on the New Maas. The river is 500 miles long.

Mexico (*mek'si-kō*), a city of Mexico, and capital of the republic, is situated in the midst of the central tableland of the country, 7,347 feet above the sea. The city is built in a valley, surrounded by hills and six lakes, of which Lake Texcuco is the largest. The principal streets are broad and well-paved, and paved roads, planted with double rows of trees, stretch far into the country in all directions. All the main streets radiate from the central square, once occupied by the great temple of the Mexican god, Huitzilopochtli, and now filled by the grand cathedral, founded in 1573, with twenty chapels, and towers and walls costing alone $2,000,000. The famous Aztec Calendar Stone is built into one of the towers. On the square are also two palaces, the post office, and national museum, with one of the finest collections of pictures in America. A monument to Columbus was erected in 1877, and there is also one to the last of the Aztec emperors. On the lakes around the city are still a few of the floating gardens for which the place was once famous. The city has a few manufactures, such as cigars, gold and silver work, pottery, etc., but its trade is largely that of a market for the surrounding country. The site is unhealthy, and many efforts have been made to drain the basin in which the city stands, the latest by an English company in 1890. The climate is pleasant, ranging from 70° to 50°. Mexico is known in history as the capital of the Montezumas, founded by the Aztecs in 1325. The city was in its full glory when Cortez conquered it in 1521, destroying a large part of the ancient town. He rebuilt it on its present plan, using a company of 400,000 Indians in the work. It was occupied by the Spaniards for 300 years, and since the establishment of the republic has been the scene of revolution and the battlefield for contending armies. Population 329,774.

Mex'ico, a federative republic in the most southern country of North America, lying between the United States and Guatemala. It is as large as Great Britain, France, Germany, and Austria together, and is 2,000 miles long, and from 130 to 1,000 miles wide. Lying between the gulf of Mexico and the Pacific ocean, it has a coast line of 6,000 miles, but only one good harbor, Acapulco. The peninsulas of Yucatan and Lower California belong to it. The country is, in the main, a great tableland, reaching a height of over 8,000 feet, sloping abruptly to the Atlantic coast, and more gradually to the Pacific. The most important range of mountains are the Sierra Madra, over 10,000 feet high, though there are several lower ranges, some running the length of the country, and some crossing it. The most elevated peaks are Toluca (19,454 feet), the highest point in North America; Orizaba (18,205) and Popocatapetl (17,523). Ten of the highest peaks are volcanoes, but they are nearly all extinct. The rivers of Mexico are of little use, being usually mountain torrents, which flow through rocky gorges 1,000 feet in depth. The largest is the Rio Grande, which forms part of the United States boundary. The climate of Mexico varies from that of the lowlands, which are tropical, to that of the tableland, which is perpetual spring, and one passes through all degrees of temperature in a few hours in going from Vera Cruz to the city of Mexico. The highest peaks are in the region of perpetual snow. The atmosphere is dry, and large parts of the agricultural regions are dependent upon irrigation; but when well-watered yield enormous crops, and often two crops in a season. The rainfall is scanty, and in the southern parts of the state there are two seasons, the wet and the dry, the wet season lasting from June to October. The products of the country are, like its climate, very varied. In the forests are palms and the India-rubber tree, as well as pines and evergreen oaks. The tropical fruits grow in abundance, with cotton, sugar cane, and coffee, while higher up are harvested large crops of wheat, corn, and barley. The yield of corn is enormous, and sometimes three or four crops are obtained in one year. The methods of farming are as a rule primitive, and the resources of the country have not begun to be developed. In the northern part cattle raising is carried on. Manufactures are few, though they supply the local demand. Foreign capital, however, is entering the state, and will soon change the trade of the country. Cotton, flour, sugar, tobacco, mahogany, and pottery are manufactured and exported. The bulk of the Mexican trade is in minerals, of which Mexico has larger supplies than any other country, including gold, silver, lead, iron, copper, zinc, quicksilver, and platinum. There are large deposits of gypsum, marble, alabaster, and rock salt. A mountain near Durango is a solid mass of magnetic iron ore. Mexican ores were formerly carried to the United States for smelting, but since the duty on the ore be-

came large, American foundries and metal works have been established in Mexico.

The people of Mexico, numbering in 1895 12,491,573, are over one-third Indians, embracing thirty-five tribes, living in communities in villages; the Mestizos, the half-breeds, with a mixture of Spanish and Indian blood, who form about one-half the population, and the higher class, which is largely Spanish. The republic to-day comprises 27 states, classified as inland states, and those adjacent to the Atlantic, and to the Pacific, besides the federal district, and two territories. The farm laborers are drawn mainly from the native Indians, who are scarcely less slaves than were their ancestors under the Spaniards. Their food is largely corn, usually ground by the women in hand mills, and baked in thin cakes, called tortillas. The higher classes have all the luxuries of New York and Paris, so that one sees the same extremes in the people and in their habits as are found in the climate and products. Education is far behind the modern standard, only nine per cent. of the people knowing how to read or write. Free schools have been established, however, in most of the towns. The people are largely Roman Catholic, though there is now no state religion. In 1867, the convents and monasteries were abolished, and religious processions in the streets forbidden. Protestant missions have been established within the last few years.

The early history of Mexico, as learnt from its monuments and picture writings, includes two periods — that of the Toltecs, and the Aztecs. The Toltecs are thought to have reached the country about the 8th century; they cultivated the land, introduced corn and cotton, made roads, and built temples, cities, and monuments, whose ruins still prove their skill. To their invention is thought to belong the Mexican hieroglyphics, or system of writing by pictures, and the Mexican calendar. They are believed to have been driven south by famine and pestilence to Guatemala and Yucatan in the 11th century. After an interval, about the end of the 12th century, the Aztecs entered the land and founded, about 1325, the city of Mexico. They were a less cultivated race than the Toltecs, but more so than the North American tribes, though they are considered now as belonging to the same family. (See AZTECS.) The Spaniards under Cortez landed at Vera Cruz in 1519, and the story of the latter's conquest of Mexico is one of the romances of history. In 1540, all the American territory belonging to Spain, including Mexico, was united under the name of New Spain, and governed by viceroys appointed by the home government. The policy of the government, however, hindered the development of the country. Mexico was looked upon simply as a mine to be worked for the benefit of Spain. The natives were distributed as slaves on the plantations, and trade with any country but Spain was forbidden under penalty of death. It was, in spite of this policy, however, one of the richest and most prosperous of the Spanish colonies. After three centuries of submission, the spirit of discontent, which had been growing during the wars of Spain with France, under Napoleon, broke out in rebellion in 1810, under the leadership of a country priest, named Hidalgo. In 1821, the last of a series of fifty-seven Spanish viceroys, O'Donoju, surrendered the capital. General Iturbide was proclaimed emperor in 1822, but General Santa Anna raised the standard of the republic, and Iturbide was banished to Italy, and shot the next year when he attempted to return. From that time on the history of Mexico is one of civil war, until 1876. Fifty-two presidents or dictators, one emperor, and a regent, ruled the country in that time.

Texas secured its independence in 1836, and in 1845 became a part of the United States. The boundary line was unsettled and a dispute over a strip of land brought on war with the United States, with its battles of Monterey, Palo Alto, Cerro Gordo, Buena Vista, and Chapultepec, ending with the taking of the city of Mexico by the Americans under General Scott. Peace was concluded in 1848, Mexico ceding to the United States half a million square miles of her territory. In 1861, under the presidency of Juarez, the country was again involved in war with the allied troops of England, France, and Spain, partly as the result of some of the internal improvements made by Juarez, such as the separation of church and state and the confiscation of church property, and partly because of acts of injustice to foreigners during this period of disorder. The difficulties were regulated by a treaty, which the French commander, however, did not agree to. Spain and England withdrew their forces, but France declared war, and entered the city of Mexico in 1863. The crown was offered to the archduke Maximilian, of Austria, who was declared emperor. After the withdrawal of the French troops from the country, owing to the remonstrance of the United States government, the republican troops under Juarez defeated the army of the emperor, who was taken and shot, in 1867. Juarez remained president until his death, in 1872, when Tejada succeeded; and in 1876, after another revolution, Porfirio Diaz, one of the ablest of Mexican rulers, became president. He was re-elected in 1884, in 1888, and again in 1900. Mexico is now divided into twenty-seven states, a federal district, and two territories. The present area of the republic is 767,005 square miles. Besides the city of Mexico (the capital), the chief towns are Puebla, Guadalajara, San Luis Potosi, Leon, Monterey, etc. The government is modeled after that of the United States. About 9,027 miles of railroads have been built, and nearly 43,000 miles of telegraph lines. Mines are being worked, coal fields opened, agricultural colonies established

and the whole country, so long behind the rest of the North American continent, started on the road to prosperity. See *Study of Mexico*, by David A. Wells; *Mexico*, in "Story of the Nations" series; *Popular History of the Mexican People*, by Bancroft; *Conquest of Mexico*, by Prescott.

Mex'ico, Gulf of, a basin of the Atlantic ocean, shut in by the peninsula of Yucatan and Florida, lies south of the United States and east of Mexico. It covers 716,200 square miles — more than one-fifth of the area of the United States. It is 1,100 miles long, though Yucatan and Florida are within 500 miles of each other. The coasts are low and sandy, with few good harbors, the best being New Orleans, Pensacola, and Havana. The island of Cuba is in the middle of the entrance to the gulf, dividing it into two straits, that of Florida, which connects it with the Atlantic ocean, and the straits of Yucatan, opening into the Caribbean sea. The largest river flowing into it is the Mississippi. The gulf stream enters the gulf of Mexico by the Yucatan channel, flows round it and passes out by the Florida strait. The gulf is visited by severe winds, called northers. See GULF STREAM.

Meyerbeer (*mī'er-bār*), **Giacomo,** a musical composer, was born at Berlin, Prussia, Sept. 5, 1791. His name was Jakob Beer, to which he added the name Meyer, a benefactor of his, and gave the whole name an Italian form. At the age of seven he played Mozart's music on the piano in public. His earlier works were unsuccessful and he proceeded to Italy for further study. He got hold at once of Rossini's style, which was just then popular, and brought out three operas, for the last of which he was crowned with laurel on the stage at Venice in 1824. In 1831, he produced *Robert le Diable* (the devil) in an entirely new style, which cast even Rossini into the shade. After the success which followed the production of *The Huguenots* he was appointed chapel master at Berlin. His *Prophet* appeared in 1849. In the comic opera, to which he now turned his attention, he wrote *The Star of the North* and *Dinorah*. His last work, *L'Africaine*, was not made public until a year after his death. He published many miscellaneous compositions, a stabat, a Te Deum, some cantatas, and songs. His operas are still popular and are frequently produced, especially at the Paris Opera. He died at Paris, May 2, 1864.

Miami (*mī-am'i*), a river in the western part of Ohio, flows south for 150 miles and empties into the Ohio river, 20 miles west of Cincinnati. The Miami canal runs beside it for 70 miles, and together they furnish extensive water-power for manufactures. It is sometimes called the Great Miami, to distinguish it from the Little Miami, which runs for 100 miles in the same direction, and flows into the Ohio, six miles east of Cincinnati.

Miamis (*mī-ām'ēz*), an Indian tribe found in the 17th century by the French near Green bay, and on the Fox and St. Joseph's rivers. They were related to the Illinois tribe and belonged to the Algonquin family. In 1721, they were found on the Miami, the Wabash, and the Ohio. In the French and English wars they sided sometimes with one party and sometimes with the other, but during the Revolution went with the English. They were hostile to the settlers, and in 1790 General Harmar was sent against them. Under their chief, Little Turtle, they defeated General St. Clair, but after a defeat by Wayne they made peace in 1794. In 1809, they yielded their lands from the Wabash to the Ohio state line, and after another struggle with the United States troops again made peace with them in 1815. They gave up all their lands in 1838 and 1840, and were finally removed to Kansas in 1846, and from there, in 1873, to the Quapaw reservation in the Indian territory. They numbered when moved only 150, having dwindled to that from a tribe of 8,000 warriors.

Mi'ca, from a Latin word meaning "to glitter," is the name of a group of minerals which are noted as being easily divided into sheets. These sheets can be made so thin that it will take one thousand of them to make an inch in thickness. There are different varieties of mica, what is called the Muscovite being the most common form. It is formed largely of silica, alumina, and potash, and is called a potash mica. It is found in granite rocks, gneiss, and in layers with quartz, making what is called mica schist. Large plates of it are sometimes found, as in New Hampshire, and in Sweden and Norway. Mines of it have been discovered in North Carolina. Other varieties, having especial names, belong to classes called soda micas, lithia micas, magnesia micas, and iron micas, according to their composition. Mica is used in stoves and lanterns, because it is transparent and will bear heat. It is used in some countries for window-glass.

Mi'cah was one of the "minor prophets," a native of Gath, in the lowlands of Judæa. He prophesied during the reigns of Ahaz, Jotham, and Hezekiah, kings of Judæa, at the same time as Isaiah and Hosea and Amos, about 759–698 B. C. The work he undertook was to reform the people, and he does not spare priests, prophets, nobles, or people, in his charges of cruelty, oppression, greediness, and ungodliness. He foretold the destruction of Jerusalem and the temple a hundred years before Jeremiah.

Mi'chael An'gelo. See ANGELO.

Michel (*mē-shel'*), **Louise,** a French anarchist and communist, was born at Chateau-Vroncourt, France, in 1839. She was a writer of verse of some power. During the outbreak of communism in Paris, after the

Franco-Prussian war in 1870, she was one of the most active leaders. In 1871, she was sentenced to exile for life, and banished to New Caledonia. In 1880, a general pardon having released her, she returned to Paris and became the editor of *The Social Revolution*. Of recent years she has resided in London, where she published her *Memoirs*, and a novel entitled *The Microbes of Society*.

Michelet (*mē-shlā'*), **Jules,** a great French historian, was born at Paris, Aug. 21, 1798. At twenty-three he became a professor of history in the College Rollin; he lectured at other colleges; became an assistant to Guizot at the Sorbonne, and in 1838 professor of history at the College of France. He wrote first small books on French and modern history, and began his great work, *The History of France*. His quarrels with the Jesuits resulted in three books directed against them. His famous *History of the Revolution*, in seven volumes, was begun in 1847. It is not considered a reliable history, though very readable. He lost his position by refusing to take the oath of allegiance to Napoleon III., and devoted himself entirely to literary work. He published a series of books on *Birds*, *Insects*, *The Sea*, and *The Mountains*, also *Woman* and *Love*. His great work, *The History of France*, begun in 1833, was finished in 1867, in eighteen volumes, and brings down the story of France to the revolution. His *History of the Revolution* carries it on to the close of that period. He began in the later years of his life a continuation, but did not live to complete it. His history is injured by his prejudices; but the characters stand out clearly, and there are passages almost unequaled in historical writings, such as his account of Joan of Arc, and of the Templars. Most of his works have been translated into English. He died at Hyères, in southern France, Feb. 9, 1874.

Mi'chelson, Albert Abraham, a brilliant physicist born at Strelno, Poland, Dec. 19, 1852; graduated from the United States Naval academy in 1873; resigned from the navy in 1881 to accept a professorship in physics at the Case School of Applied Science. When Clark university was founded, he resigned at Cleveland to accept a similar appointment at the new institution. Since 1893, he has been head-professor of physics at the University of Chicago.

His earliest important work was an improvement in Foucault's method of measuring the speed of light. These researches were carried out at the Naval Academy in 1878–80. His various memoirs on the interference of light waves, on the relative motion of the earth and the ether, on the length of the standard meter in terms of the wave-length of codmium light, and on the new echelon spectroscope are so important as to have already become classical. Besides his scientific attainments, Professor Michelson is a man of very varied accomplishments, and, naturally, the recipient of many honors from various universities and societies.

Mich'igan, one of the western states of the Union, is made up of two peninsulas, separated by the Straits of Mackinac. The lower peninsula is the larger and lies between Lake Huron, Lake Michigan, and Lake Erie, and the upper one lies between the lakes Huron, Michigan, and Superior. Its land surface covers, approximately, 57,430 square miles, and is larger than England and Wales; it is about 500 miles long. A considerable part of the state is water, there being besides the Great Lakes on its borders, over 5,000 small lakes. It has a coast line of 1,624 miles, with 120 lighthouses and many fog-signals. The lakes have many islands; the Manitoulin Island in Lake Huron, among the largest, covers 1,000 square miles. Lake Huron alone has 3,000 islands. The Straits of Mackinac, the passage between Lake Michigan and Lake Huron, are only four miles wide. Several large bays are on the coast,—Saginaw Bay on the east, and Great and Little Traverse on the west. The passage from Lake Erie to Lake Huron is through the Detroit river, Lake St. Clair, and the St. Clair river, the Detroit river being 20 miles and the St. Clair river 40 miles in length. The Lake St. Clair canal, called the Cut, was built in 1871, and is 8,200 feet in length, and is used by over 2,500 ships yearly. The St. Mary's ship canal, at the head of the St. Mary's river, has the largest lock in the world, and more ships pass through it than through the Suez canal. The largest rivers are the Grand, 270 miles, Saginaw, Au Sable, Kalamazoo, and St. Joseph. The upper peninsula has the highest land in the state, the Porcupine mountains, and the Mineral Range a little farther south. The climate is warmer than that of the same latitude in Wisconsin, and its fruits and flowers more varied. Michigan has large salt wells, the product being already greater than that of New York. Coal, though not of the best quality, is found; grindstone quarries are in operation, while large amounts of fire clay are used in the manufacture of drain pipes, etc. Marble, freestone, limestone, and glass sand, with copper and iron, also form the mineral wealth of the state, besides its many mineral springs. The iron ore is the purest in America, and amounts to one-fifth of the whole product in the United States, and is found mostly in the northern peninsula. The richest copper mines in the world are found near Lake Superior, at Keweenaw Point, and gold mines are in operation near Ishpeming. The soil is a light, sandy loam, barren in the north, but rich and fertile in the south, and the state is one of the best fruit states in the Union. The lumber business is the chief industry of the state, besides the production of iron ore, Michigan standing first in the value of its lumber. The forests of the

northern part are almost inexhaustible and keep at work 1,000 mills. Among the manufactories of Michigan are many depending upon the large supply of lumber, such as wooden bowls, windmills, broom handles, pumps, wheelbarrows, wood pulp, veneers, carpet sweepers, beehives, and toys. Shipbuilding is carried on largely, and the making of cars of all sorts and snow-plows for the use of railroads. Other industries are connected with the beet-sugar production, with that of fermented liquors, and with the manufacture of tobacco and cigars. There are also considerable activities in the state in the operations of creameries and cheese factories.

The University of Michigan at Ann Arbor, one of the largest institutions in the country, was one of the earliest and most successful of the state universities. The Agricultural college of the state is at Lansing, the Mining school at Houghton, and there are colleges at Kalamazoo, Adrian, Albion, Battle Creek, Hillsdale, Detroit, Olivet, and Holland. Fort Wayne, near Detroit, commands the river and has a small garrison. Michigan has done and is doing considerable for elementary as well as for higher education. Besides her nine colleges and universities for both sexes and her professional schools, she maintains nearly 8,000 schoolhouses and a staff of 15,560 teachers.

Michigan was first visited by French Jesuits and a mission established for the Chippewas in 1641, and in 1688 Father Marquette renewed the mission and later formed another at St. Ignace for the Hurons, which soon became a French fort. Other settlements were made by La Salle, Duluth, and Cadillac. In 1760, there were British garrisons at Detroit and other points, many of them being destroyed by the Indians under Pontiac. Detroit was the capital of the British possessions in the northwest until 1796. In the War of 1812 it was taken by the English and retaken by Commodore Perry. Michigan was admitted to the Union in 1837. The capital is Lansing (population 16,485), though the chief city is Detroit (population 285,704). The population, 2,420,982, includes 6,000 Indians and a large number of Canadians. See *Michigan*, by Cooley.

Mich'igan City, a town in Laporte county, Ind., on Lake Michigan, and its only lakeport, 38 miles east of Chicago. It has a good harbor, and manufactures cars, refrigerators, boots, and furniture. It contains a college and state prison and car shops. Population 14,850.

Mich'igan Lake, the third in size of the five great fresh-water lakes of America, and the only one lying entirely within the United States. It separates the states of Illinois and Wisconsin from Michigan, the upper portion of the lake dividing the state of Michigan into two parts. It is 338 miles long and from 50 to 88 broad, and covers 22,450 square miles. Its shores are low, with several lighthouses, and good harbors at Chicago, Milwaukee, and Racine.

Micklewicz (*mits-kyā'vitch*), **Adam.** See LITERATURE.

Micrometer (*mi-krŏm'ē-tĕr*), an instrument for measuring the dimensions of very small objects. The object measured is nearly always the image produced by a microscope or by a telescope. From the size of the image the angular or linear size of the object may be inferred when the focal lengths of the lenses are known.

Practically all micrometers are based upon the principle of the screw. In the focal plane of the instrument is fixed one line, usually a spider web. On a small metallic frame is mounted another spider web. This metallic frame is the nut of a screw with a fine thread and a divided head. By moving the instrument or the object, one side of the object is made to coincide with the fixed thread and the other side of the object with the movable thread. The number of revolutions of the screw required to carry the movable thread from this position to one of coincidence with the fixed thread is the size of the object in terms of the screw. The angular distance between two stars can thus be measured with the greatest accuracy; while with a microscope objects even smaller than $\frac{1}{100000}$ part of an inch have been measured.

Microphone (*mī'krō-fōn*), an instrument in which sound waves are employed to produce variations of electrical resistance, and hence transmit electrical effects to a considerable distance. The principle upon which the instrument rests is the fact that the electrical resistance of carbon varies with pressure to which the carbon and its connections are subjected. One of the earliest forms of microphones was that devised by Hughes in England in 1878, which consisted essentially of a small rod of gas carbon, standing upright with its lower end on a carbon button and with its upper end held in a carbon collar. These three carbons, resting upon a resonance box, formed a part of an electric circuit, which included also a telephone. This instrument is so sensitive that the tread of a fly can be heard at a long distance.

The modern telephone transmitter is essentially a microphone, in which the pulsations of the air due to the human voice alternately increase and diminish the pressure at one of the contacts in the telephone circuit. See TELEPHONE.

Micropyle (*mī'cro-pīl*) (in plants), the small opening left by the integument or integuments of an ovule, through which the pollen tube ordinarily passes to the nucellus. When the seed ripens, the micropyle is usually left as the weakest spot in the seed coat, and through it the embryo first protrudes. See OVULE.

Mi'croscope, a magnifying instrument. The simple microscope consists of a single convex lens or set of lenses by which the object is viewed directly. The compound microscope is a combination of lenses, one set — the objective — placed near the object forms a real image, and this is further enlarged by a magnifying eyepiece placed next to the eye of the observer. The date of the invention of the microscope is uncertain. It is known that Roger Bacon, in 1276, used a lens of rock crystal for magnifying objects, and he is generally regarded as the inventor of the simple microscope. The weight of evidence seems to point to Galileo as the inventor of the compound microscope in 1610. Those ascribed to the Janssens in 1590 were simple microscopes. Simple microscopes were brought into general use by Leeuwenhoek (1632–1723) and by Malpighi (1628–94) in the 17th century. The former had a collection of more than four hundred lenses, magnifying from forty to two hundred and seventy diameters, and he was the father of microscopic observation. From that time to the present the microscope has been greatly in use. At first, it was the newness and the wonders of the microscopic world that made the attraction, but gradually it came to be used as a tool or implement of study. In 1840, the manufacture of lenses or magnifying glasses was vastly improved, and, ever since, the microscope has been used in research to serious purpose. It has been the means of showing the minute structure of all tissues, the protoplasm upon which their activity depends, their condition in health and disease. It has shown the germs of disease, it has made possible an analysis of the sense-organs, and has helped greatly in the comprehension of all nature. Many brilliant and important discoveries have been reached through its use. See BACTERIA, CELL DOCTRINE, DEVELOPMENT, PROTOPLASM.

The compound microscope consists of mechanical parts and optical parts. The mechanical parts taken together constitute the stand (see illustration). This has a base, or foot, from which rises a supporting pillar carrying a stage and an arm. The stage is for holding objects to be examined; it is perforated by a round aperture, through which light is thrown from a mirror located underneath the stage. The size of the aperture is usually regulated by an iris diaphragm, and often there is a glass condenser for the light. The arm carries a tube in which the lenses are inserted. Finally, there is a means of bringing the lenses into focus. This is accomplished by a coarse adjustment — usually a rack and pinion movement — to move the tube quickly into position, and a fine adjustment, for slow movements, to get an accurate focus. The latter is very important in using lenses of high magnifying power. It is usually a micrometer screw and spiral spring. A good stand should be firm, low enough to work upright in order to avoid currents in fluids, which occur when it is tilted, and should have a good fine adjustment. The lenses, or optical parts, are the most important parts of a microscope. Those which do the greatest amount of magnifying are attached to the tube, near the object, and called objectives. The oculars, or eyepieces, fit in the tube near the eye of the observer. The degree of magnifying power depends on the lenses used. The ordinary working powers range from seventy-five to five hundred diameters. When a higher degree of magnification is desired, it is not necessary to purchase a new microscope, but simply to get a new objective. The cost of objectives of high magnifying power is considerable, and the difficulty of working with those magnifying above six hundred diameters is also considerable. Student's microscopes can be obtained from $15 upward; a good one will cost $40 and upward. There are many good makers of microscopes, but those most highly esteemed at the present time are made by Bausch and Lomb, of this country, Leitz, of Westlar, and Zeiss, of Jena, Germany. Microscopic technique has become an art and a science, and on it much of success in discovery depends. See Carpenter's *The Microscope and Its Revelations* (7th edition, 1891), and Beale's *How to Work with the Microscope.*

MICROSCOPE.

Microsporangium (*mī'kro-spo-răn'gĕ-ŭm*) (in plants), the sporangium which produces microspores. In pteridophytes they are produced by the water ferns, selaginella, and isoetes; while in all seed-plants (spermatophytes) the so-called pollen-sacs are microsporangia. See HETEROSPORY.

Microspore (*mī'krō-spōr*) (in plants). In cases of heterospory (which see) the small asexual spores are called microspores. In germination a microspore produces a male gametophyte, that is, one which bears the sperms. Microspores are found in a few pteridophytes and in all spermatophytes. In

the latter group the microspores are better known as pollen-grains. See HETEROSPORY.

Microsporophyll (*mī'kro-spo'ro-fil*) (in plants), the sporophyll which bears microsporangia. They are chiefly developed in seed-plants, where they are usually called "stamens." See HETEROSPORY.

Midas (*mī'das*), one of the ancient kings of Phrygia, who are always called either Midas or Gordius. According to mythology, Midas, for a kind act, was promised by Dionysius whatever he should ask. He, believing gold to be the best possible thing, asked that everything he touched should turn to gold; but when the request was granted, he found to his sorrow that there are many things more necessary, for even his food became gold, and, in danger of starving, he begged the god to take back the gift. He was sent to wash in the river Pactolus, the sands of which still yield grains of gold. He decided a contest between Pan and Apollo in favor of Pan, and Apollo in revenge gave him a pair of ass's ears, which he hid under a cap. The secret so oppressed his barber that he dug a hole in the ground and whispered into it, "King Midas has ass's ears." The reed is said to have grown from this hole, and is thought to whisper the secret whenever stirred by the breeze.

Mid'dle Ages, also called mediæval, is the period between ancient and modern times in history. It is generally thought to begin in 476, after the downfall of the western empire of Rome, and to end with the reformation in the first part of the 16th century, or a little earlier, in the latter part of the 15th century, when America was discovered, printing invented, and the new impulse given to learning by Greek refugees from Constantinople. The term, "Dark Ages," is used to cover about the same period, and indicates the time in history when learning was at its lowest stage, between the era of the classical literature of Greece and Rome, and the literature of modern Europe.

Mid'dlebury, a town in Vermont, 33 miles southwest of Montpelier. The region is picturesque, with views of the Green mountains and near-by Lake Dunmore, five miles long, nestled among the hills. A fine variety of marble is quarried here, and there are several manufacturing establishments. It is the site of Middlebury college, founded in 1800, and having at present eleven professors. Population 1,897.

Middlesbrough (*mid'dlz-b'rŭh*), a manufacturing town of Yorkshire, England, near the mouth of the river Tees. In 1829, there was only a single farmhouse, surrounded by marshes, on the site of the town. Its growth is due to the discovery of iron ore in the Cleveland hills near by. One-third of the great iron production of the United Kingdom is from the Cleveland mines. The industries of the city are iron and steel works, blast furnaces, sawmills, shipbuilding, wire, nail and tube works, and large salt and soda works. It has fine public buildings and large parks. In 1899, the total tonnage entered and cleared, excluding the merely coastwise tonnage of Middlesbro', was next to that of Swansea — viz., 2,100,000 tons. Population 80,000.

Mid'dletown, N. Y., a town in Orange county, southeastern New York state, 24 miles west of Newburg, and 65 miles northwest of New York city. It is an agricultural and pastoral region, and is served by the Erie, the New York, Ontario and Western, and the New York, Susquehanna, and Western railroads. Here is the New York Homeopathic hospital for the insane. It is well supplied with schools, churches, libraries, banks, etc., and its industries embrace woolen-hat factories, silk and handkerchief mills, and saw and file works. Population 14,522.

Mid'ianites, an Arab race, inhabiting the country between the Red sea and the plains of Moab, near the Dead sea. Their caravans traveled from Egypt to Syria, carrying gold and incense to Palestine. Jethro, the father-in-law of Moses, was either a priest or a chief of the Midianites. They were troublesome neighbors to the Israelites until conquered by Gideon. They worshiped Baal-Peor. In the times of the Romans there were valuable mines in Midian, and petroleum is found there. The country became a Turkish possession in 1887.

Mid'rib (in plants). In case there is one central main rib in a leaf, this is spoken of as the midrib. It is found in leaves of the pinnate type of venation. See LEAF.

Mignonette (*min'yŭn-ĕt'*), a plant cultivated for its fragrance, and a native of North Africa. The name means "little darling." It has long clusters of small greenish-yellow or white blossoms, and is cultivated by florists for bouquets on account of its well-known delicious odor.

Milan (*mil'an* or *me-lan'*), a city in Italy, the third in size, ranking next to Rome and Naples. It stands in the great Lombard plain, 25 miles south of Lake Como, at the foot of the Alps. Surrounded on three sides by walls, it is entered by fourteen gates. Though an old city, it has been ravaged by war so often as to have few ancient buildings. The modern city has broad, regular streets, fine buildings, and attractive promenades. The cathedral, on the site of two more ancient ones, begun in 1386, was finished, by order of Napoleon, in 1805–13. There are 6,000 statues in niches on the outside, and a great number of pinnacles. The church of St. Ambrose (868), St. George (750), and St. Maria (1463), with Leonardo da Vinci's famous painting, *The Last Supper*, on its walls, are other ancient churches. The palace of arts and sciences

has a valuable collection of paintings by Raphael, Titian, Vandyck, Mantegna, and others. The national library has nearly 200,000 volumes, with a museum and an observatory, and the Ambrosian library, 175,000 volumes, and a fine collection of paintings and engravings. There are numerous palaces, an arch of peace, built of white marble, in memory of Napoleon, the arcade of Victor Emmanuel, used as a promenade, an arena for shows and races, holding 30,000 people, and the great hospital for 2,500 patients. The city has an extensive trade in silk, cotton, grain, rice, and cheese, and manufactures silks, velvets, gold, silver, and iron wares, railroad cars, tobacco, and porcelain. It is also a center of the printing trade, and the chief banking city of northern Italy. Population 492,162. Historically, it was a town of the Gauls, was conquered by the Romans in 222 B. C., and became a rich and important city. In the 4th century, it was the court city. The Huns, the Goths, the Longobards, and the Franks held it at different periods until it was subjected to the German empire in 774; and several of Charlemagne's successors were crowned at Milan. In the 11th century, as the head of the Lombard league, Frederick I. twice besieged it, and once almost destroyed it. In 1395, the Ghibellines made Milan the capital of a duchy, which extended over the whole of Lombardy, Matteo Visconti being the first duke. From 1450 to 1535 his successors, the Sforzas, ruled the country. It passed then to Spain; from Spain to Austria, and from Austria to Napoleon, who made it the capital of Italy. It belonged again to Austria until the peace of Villafranca (1859), when it was ceded to France, and yielded by France to Sardinia.

Mil'burn, William Henry, known as the "blind preacher," was born at Philadelphia, Sept. 26, 1823. He was a Methodist clergyman and traveled over 200,000 miles in his circuits. In 1856, he was chaplain of the house of representatives at Washington, a position he filled for many years, being re-elected at different periods. He wrote a number of books, *Rifle, Axe, and Saddlebags*, *Ten Years of Preacher-Life*, and *Pioneer Preachers of the Mississippi Valley*, being among them. He died in 1901.

Mil'dew, the name of various plants (fungi), but chiefly applied to a large group of the ascomycetes (which see), which are external parasites growing chiefly upon the leaves of seed-plants and covering the surface like a delicate cobweb. The mildew on lilac leaves is one of the most common forms, this host plant being very seldom free from it. The "downy mildews" belong to the phycomycetes (which see), and are destructive internal parasites. One of the commonest forms attack grape leaves, making its presence known by small downy patches which come to the surface and consist of minute branches bearing spores.

Miles, Nelson A., an American general, was born at Westminster, Mass., Aug. 8, 1839. At the outbreak of the Civil war he entered the 22d Massachusetts volunteers as lieutenant. He was in every battle of the army of the Potomac, with one exception (and was then absent on account of desperate wounds); distinguished himself at the battles of Fair Oaks, Fredericksburg, Chancellorsville, Malvern Hill, Spottsylvania, Richmond, and many others; was thrice wounded, and at Chancellorsville was carried from the field with what was then supposed to be a mortal wound. His bravery and abilities won for him promotion after promotion until he became a major-general and was placed in command of a division. When the volunteer army was disbanded, in September, 1866, he was commissioned colonel of the 40th United States infantry. In March, 1869, he was transferred to the 5th infantry. Since then, his promotion has been rapid, having been made brigadier-general in 1880, and major-general in 1890.

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Since the close of the Civil war, General Miles has earned fame as an Indian fighter. He conquered the hostile Sioux in Montana, and drove Sitting Bull, their leader, into Canada in 1876, after the massacre of General Custer and his force. In 1877, General Howard having pursued the Nez Perces for 1900 miles and arranged for their surrender, designated General Miles to receive the surrender of Chief Joseph. The next year General Miles captured the Bannocks near Yellowstone Park. He served from 1880 to 1885 in the department of the Columbia, and was then transferred to the department of the Missouri, and the next year to Arizona, where he compelled the Apache chiefs Geronimo and Natchez to surrender. In 1890, during the "ghost dance" outbreak among the Sioux, General Miles had command and forced a surrender in January, 1891, at Wounded Knee, South Dakota. On the retirement of General Schofield in 1895, General Miles succeeded to the command of the United States army. In the Spanish-American war, he was at the head of an expedition to Porto Rico, effecting a landing at Guanico, July 25, 1898. He has published *Personal Recollections*, and a work entitled *Military Europe*. He was promoted to the rank of lieutenant-general in 1901.

Miletus (*mi-lē'tus*), an ancient city of Ionia, in Asia Minor, near the river Meander. It was famous for its woolen cloth and carpets and furniture, and had a very large trade. Nearly eighty colonies were founded by its citizens on the Black sea and in the Crimea. They sent their fleets to all parts of the sea, and kept up a long war with the kings of Lydia until conquered by Crœsus. Under the elder Cyrus the city was conquered by Persia, and again, after a rebellion, was taken by Darius and nearly destroyed. Although rebuilt and sufficiently powerful to contend with Alexander, who took it by storm, it never regained its importance, and was finally ruined by the Turks.

Milk, the well-known white fluid obtained from the cow, though the milk of goats and asses has been made use of. It is one of the most important foods we have, as it contains all the elements needed for the body, and is easily digested. When examined by a microscope it is seen to consist of a large number of round substances, or globules, which are transparent and very small, and float in a colorless fluid. These globules are made of fat, with a thin coating somewhat like the white of an egg, called casein. When the milk stands, the larger globules rise to the top and make the cream, which is the fattest or richest part of the milk. When the cream is shaken, as in a churn, these globules break, and the fat runs together, making lumps, which is called butter. The casein which surrounds the globules of fat, and which is also dissolved in the liquid, if it becomes sour, either naturally, by exposure to the air, or by the addition of rennet, or an acid of any kind, collects into masses called curd. This change is brought about partly by minute forms of animal life, called microbes, which get into the milk from the air, and this is one reason why it is so necessary to purify by heat, usually hot water, all the articles used about milk. These clots or curds, made by the addition of rennet to the milk, are pressed into blocks and make cheese, which is a very rich food, containing all the fat of the milk, as do cream and butter, and besides the casein, which is an albuminous substance. Condensed milk is prepared by sweetening the milk, and evaporating it until it loses about one-half or three-fourths of its bulk. It is poured into tins while hot, and sealed. When used it is diluted with several times the quantity of water. The adulteration of milk by adding water, starch, or chalk, is frequent in large cities, and has called for boards of inspectors, and produced instruments, known as lactometers, for detecting it. The most common fraud, however, in the sale of milk is removing the cream. The supplying of a large city with cream and milk creates a great business, and employs many men: those who milk the cows at all hours of day or night; the railroad employees who run the great milk trains; the large dealers who distribute it to the wagons; and the drivers of the milk-carts whose noisy clatter disturbs the early morning nap, but whose faithful labors in heat or cold furnish the milk and cream for our breakfast.

Milk'weed, species of Asclepias, a genus of the milkweed family, which contains about 85 species, mostly natives of the western hemisphere, nearly 50 of these species occuring in North America. The name comes from the fact that they contain a milky juice which exudes from wounds. They are also often called "silkweeds" from the fact that the large pods contain numerous seeds bearing beautiful tufts of silky hair. One of the most attractive forms is the "butterfly-weed" or "pleurisy-root" (*A. tuberosa*), whose flowers are bright orange. The other forms are taller and have chiefly purplish to red flowers, occasionally white. The flowers are all very much modified for insect pollination, the pollen grains clinging together in masses which are carried off by the insects bodily. Probably the commonest known milkweed is *A. cornuti*, also known as *A. syriaca*. The weed grows in fields and moist places everywhere, and has a stout tall stem and broad opposite leaves.

Milky Way, a band of faint light which stretches across the sky from horizon to horizon. The light is produced by a multitude of stars so distant or so small that they can be distinguished only by the telescope. It is brighter in the southern sky than in the northern. In one part of its course it divides into two branches.

Most of the stars in the milky way are of less than eighth magnitude. Among them are many star clusters, but very few nebulæ. This feature of the heavens is frequently called the *Galaxy*, which is merely the Greek word for *Milky Way*.

Herschel, who was a profound student of this subject, suggested that the galaxy is a natural plane of reference for the stellar universe, just as the ecliptic is a natural plane of reference for the solar system.

Mill, John Stuart, the son of James Mill, who was also known as a writer and utilitarian philosopher, was born at London, May 20, 1806. His early education was carried on by his father, beginning with the study of Greek when three years old, and making him at fourteen as advanced as most young men at the end of their period of study. But as he says himself, he was "never a boy." His recreation was in the form of long walks with his father, where the process of education was carefully carried on by questions and answers. His first writings appeared in a newspaper in 1822. In the same year he received an appointment in the India office, which he held until the East India company transferred its power to the crown, leaving its employ as the head of a department. Before he was

twenty, he was recognized as a leader in philosophy and politics, and was the most frequent contributor to the *Westminster Review*—a magazine which represented the ideas of his party. He somewhat changed his philosophical theories later, under the influence of Maurice, Sterling, and Coleridge. His most important works are his *System of Logic*, *Principles of Political Economy*, *Auguste Comte and Positivism*, *Considerations on Representative Government*, *Dissertations and Discussions*, *England and Ireland*, and *On Liberty*. He was radical in politics, and very much in favor of woman's suffrage, leading in the movement in England to give women legal and political rights. He died at Avignon, France, May 8, 1873. See his *Autobiography*, which appeared in the year of his death; also *Life*, by Bain; *Life and Works*, by Herbert Spencer, Thornton, Fox Bourne, and others.

Millais (*mil-lā'*), **Sir John Everett,** an English painter, was born at Southampton, England, June 8, 1829. His *Pizarro seizing the Inca of Peru* was shown by him at the Royal academy when only seventeen and was considered equal to the best historical paintings then exhibited. He became connected with Rossetti and Hunt, and was much influenced by them, as well as by the writings of Ruskin on art. Pictures of this period of his life are *Christ in the House of His Parents*, called *The Carpenter's Shop*, *The Woodman's Daughter*, and *The Huguenot*. After his election, in 1856, to the Royal academy, he exhibited *Autumn Leaves;* later he finished the *Vale of Rest*, *The Minuet*, and *Rosalind and Celia*. His later works show another change in his ideas of art, and in their brilliant coloring and high finish are almost unrivaled in modern work. The *Boyhood of Raleigh*, *The Gambler's Wife*, *The Proscribed Royalist*, *Yeoman of the Guard*, *Yes or No*, *The Order of Release*, *The Black Brunswicker*, and *Effie Deans*, are among his later paintings. His illustrations published in *Good Words*, *Once a Week*, and the *Cornhill Magazine*, placed him in the first rank of wood-cut designers. A collection of nearly twenty of his pictures was brought together in 1881 by the Fine Arts society of London, and 159 of them were exhibited at the Grosvenor gallery in 1889. He died at London, Aug. 13, 1896.

Miller, Hugh, a Scotch geologist and writer, was born at Cromarty, in north Scotland, Oct. 10, 1802. His education was gained mostly by reading in the intervals of his work as a stonemason. In 1829, his *Poems written in the Leisure Hours of a Journeyman Mason* appeared, and in 1835 *Scenes and Legends of the North of Scotland*. His famous *Letter to Lord Brougham*, in the church disputes in Scotland, brought him into notice, and he was invited to Edinburgh to edit a Liberal and Presbyterian newspaper, *The Witness*. A series of geological articles in this paper, when published in book form, was called *The Old Red Sandstone*, and contained an account of his discovery of fossils where they had never been thought to exist. His work brought him the notice of Murchison and other great geologists, Agassiz saying "he would give his left hand to possess such powers of description." He contributed at least one thousand articles to *The Witness*, and also contributed to *Chambers' Journal*. He wrote also *Footsteps of the Creator*, *My Schools and Schoolmasters*, *Testimony of the Rocks*, and *Cruise of the Betsey*. He was one of the first writers to make geology popular, and his books are very readable to those not particularly interested in that science. He died at Portobello, near Edinburgh, Dec. 24, 1856, having shot himself in a fit of insanity. See *Life*, by Peter Bayne.

Miller, Joaquin, the pen name of an American poet, named Cincinnatus Heine Miller, born in Indiana in 1841. His early life was spent in Oregon and California, and among the Indians. He wrote verses in these early days, though with very little knowledge even of the rules of grammar. He studied law, and began practice in Oregon, where he wrote his poems, published first in London, *Songs of the Sierras*. He has since written *Songs of the Sunland*, *Ships in the Desert*, *Songs of the Mexican Seas*, *Songs of Italy*, and *Building of the City Beautiful*. He is a well-known contributor to newspapers and periodicals. Since 1887 he has made his home in California.

Millet, a name applied to several important grasses. The original millet or "broom-corn millet" of Europe is *Panicum miliaceum*. In the United States the common millets are forms of *Setaria italica* known as the "foxtail millets"; while the well-known "millet-grass" is *Milium effusum*. To the common brown millet (*P. crus-galli*) the name "Japanese millet" is sometimes given.

Millet (*mil'let*), **F. Davis,** an American traveler and artist, was born at Mattapoisett, Mass., in 1846. He graduated at Harvard in 1869, and for some time afterward was connected with one of the Boston journals. He then went abroad, studying art in Antwerp and Paris. Upon his return to America he was associated with John La Farge and Francis Lathrop in the interior decoration of Trinity church. In 1878, he went to the front in the Russo-Turkish war and served as war correspondent of *The London Graphic* in the Balkans (1878). He designed the costumes for the Greek play at Harvard in 1880. His later work has been done in studios at New York or at London.

Millet (*mē-lā'*), **Jean Francois,** a French painter, was born in the village of Gruchy, France, Oct. 4, 1814. The son of a farmer,

he at first worked as a farm laborer, but his taste for painting was so evident that he was sent to study with Monchel, a painter in Cherbourg. His master induced the town authorities to grant his pupil an annuity to help him in his studies. He went afterward to Paris and studied with Delaroche. He painted small pictures, portraits, and signboards in his first efforts to support himself. After the revolution of 1848, through which he had struggled practicing his art, and fighting at the barricades, he settled in Barbizon, near the Forest of Fontainebleau. He lived here much like the peasants and began his work of painting the peasant life of France. *The Sower*, *Peasants Grafting*, *The Gleaners*, *Waiting*, *The Angelus*, *The Man with the Hoe*, *Wool-Carding*, and *Shepherdess and Flock*, are some of his best-known works. His most celebrated picture, *The Angelus*, sold for over $100,000. It was exhibited for a year in the United States. He died at Barbizon, which under his influence had become an artist colony, Jan. 20, 1875. See *The Barbizon School*, by Millet.

Mill'ville, N. J., a town in Cumberland county, on the Maurice river, connected by electric railway with Bridgeton, in southern New Jersey, forty miles southeast of Philadelphia. It is served by the West Jersey railroad; north of the city is an extensive public park and fine sheet of water — Union lake. It possesses a number of churches, schools, banks, etc., and has several industries, including cotton mills, and iron and glass factories. Population 10,583.

Mil'man, Henry Hart, an English divine, historian, and poet, and dean of St. Paul's, London, was born at London, Feb. 10, 1791, and died near Ascot, Sept. 24, 1868. He was educated at Eton and Oxford, and in 1812 won the Newdigate prize with a poem on the "Apollo Belvedere." Early in his career he published a number of poems of much merit, several of which were in Latin, and in 1821 was elected professor of poetry at Oxford. His published writings embrace, besides his verse, a *History of Christianity*, a *History of Latin Christianity*, a *History of the Jews*, *Lives of Horace* and *Edward Gibbon*, the historian, a volume of *Bampton Lectures*, etc. He was at one time canon of Westminster, rector of St. Margaret's, London, and finally dean of St. Paul's.

Mil'ner, Alfred, Lord, G.C.M.G., British Governor of Cape Colony, and since 1897 High Commissioner of South Africa, was born in 1854 and educated in Germany, at King's college, London, and Balliol college, Oxford. Early in life he studied law and became a barrister, but, turning to journalism, was for a time a writer on the staff of the London *Pall Mall Gazette*. In 1885, he became private secretary to the Hon. Geo. J. Goschen, then British chancellor of the exchequer, and from 1888 to 1892 he acted as under-secretary for finance in Egypt, an experience as a resident of the country which enabled him to write *England in Egypt*, published in 1892. In the latter year he returned to England and served five years as chairman of the government board of inland revenue, when he was appointed governor of the Cape and chief commissioner of Great Britain in the negotiations at Bloemfontein, in May, 1899, preceding the Boer war. He is a man of acknowledged ability and tact, and, during a visit to England, in 1901, was made a Peer.

Milo (*mī'lō*), a Grecian athlete, born the latter part of the 6th century, was celebrated for his great strength. He was six times a victor in wrestling in the Olympic games and as often in the Pythian. He is said to have carried a live ox on his shoulder four times around the race-course of the Olympic games and then to have eaten the whole animal in one day. When Pythagoras and his scholars found the house in which they were gathered falling, Milo held it up on his shoulders while they escaped. But in his old age his strength proved his ruin, for in trying to split open a tree with his hands he was caught and held fast until devoured by wolves.

Miltiades (*mil-tī'a-dēz*), an Athenian general, who lived in the early part of the 5th century B. C. He was ruler in Chersonesus and took part against the Scythians, and was one of the ten generals chosen to resist the Persian invasion of Attica. When the generals were hesitating whether to risk a battle immediately or defend their country behind the city walls, through his influence the vote was in favor of a battle at once. When his turn came to command, he engaged the enemy and won the famous battle of Marathon. He was given command of a fleet of seventy vessels, and made an attack on the island of Paros, but failed in the attempt. He was condemned to pay a heavy fine and was thrown into prison because he was unable to pay it. He died in prison (about 489 B. C.) of a wound he had received at Paros.

Mil'ton, John, one of the greatest of English poets, ranking next to Shakespeare, was born at Cheapside, London, Dec. 9, 1608. He studied under private tutors, and at Christ's college, Cambridge. When he had finished his studies, he was prevented from entering the church, the only profession he desired, by its disturbed condition at the time. He settled down at home to study with the distinct purpose of making himself a poet. He had already written *Hymn to the Nativity* and some Latin verse. He wrote at this period only four poems, *Comus*, *Lycidas*, in memory of a friend, *L'Allegro*, and *Il Penseroso*. In 1638, he visited Italy, and received much attention from the poets and literary men of that country. He hastened back to England at the news of hostilities between Charles I. and Scotland, and for a long period the poet gave way to the politician. His

prose works are largely made up of pamphlets, which appeared on subjects which were in

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dispute either in church or state, such as five on church government, one on education, and two in defense of the execution of Charles I., one of them being his famous reply to Salmasius. His famous *Areopagitica*, written in favor of free speech, was called forth by a threat of prosecution for the publishing of his tracts on *Divorce*. These had been written in 1643, when his wife, after a few weeks of married life, had gone home, and refused to return to him. There is much evidence that the pair were little suited to each other, and that the austere life of the Puritan home proved very cheerless to the young girl brought up in gay royalist circles. She returned to him in 1645. Cromwell rewarded Milton for his political papers with the office of secretary of foreign tongues, where his duty was to carry on the foreign correspondence of the government in Latin, the language used by the commonwealth. He was better fitted for the position than anyone in England, and held it until the restoration of the monarchy. He lived in concealment after the accession of Charles II., until placed in safety by the act of indemnity. His eyesight failed him entirely in 1654, and all his later work was written by another hand, usually one of his three daughters, who also spent many hours in reading to him in Latin and Greek, neither of which languages they understood. After about twenty years of silence, the poet sent forth his great work, *Paradise Lost*, finished in 1663, and published in 1667. He received $25 for the copyright, with a promise of the same amount with the sale of the first 1,300 copies of each edition. He received the second and third payments, and in 1681 his widow yielded up her rights in the book for $40. Thirteen hundred copies were sold in twenty months, which, considering the age, and the lack of reviews and other modern means of making a book known, gives some idea of Milton's rank as a poet among his own people. *Paradise Regained* was written at the suggestion of a Quaker friend, who intimated that Satan was the main hero of *Paradise Lost*. *Samson Agonistes* is the poem of his old age. His home-life seems never to have been peaceful until his third marriage, when his daughters left his home, and his last years were passed in cheerful retirement, solaced with music and friends. His last work, a Latin *Treatise of Christian Doctrine*, came into the hands of a state officer, and was placed in the state-paper office, and was accidentally discovered in 1823, nearly 150 years after it was written. He died in London, Nov. 8, 1674, already acknowledged to be the first poet of his age and country. See *Life*, by Masson; Johnson's *Lives of the Poets;* Trent's *John Milton;* and *Life*, by Mark Pattison, in "Men of Letters" series.

Milwaukee (*mil-wâ'kē*), the largest city in Wisconsin, is situated on Lake Michigan, 85 miles north of Chicago. It is at the mouth of three rivers, which are navigable, and, with a canal, make some twenty-two miles of docks. Milwaukee bay is seven miles wide, and furnishes a good harbor. The bluffs are terraced and parked, and stand 80 feet above the water. The city is built largely of what is known as Milwaukee brick, which is cream-colored, and gives the city its name of the "Cream City." It is 6½ miles long, its extreme width 5¼ miles, and its area 23.1 square miles. There are 600 acres of public parks connected by boulevards, wide, shaded streets, good water works, and many fine public buildings. Among these are the Federal building, a public library, city hall, free art gallery, large hotels, and many churches, and near the city the national home for disabled soldiers, with 2,400 inmates. Milwaukee has a well-organized system of public schools: three high schools, and 55 schools of lower grade, with 875 teachers and an attendance of 41,500 pupils. There are 75 incorporated colleges, academies, and lower schools with an attendance of 23,420. It has a very complete system of water works, costing over $5,000,000, and 140 miles of electric street railway. Milwaukee is one of the foremost grain ports of the world, and its immense flour mills and grain elevators can fit out a commercial fleet. It has nearly four thousand manufacturing establishments, with 67,000 employes, making large quantities of leather and leather goods, iron, and brass products, engines and machinery. The capital invested in manufactures is $125,000,000, and the annual output $175,000,000. It has an enormous beer trade, the Pabst brewery being one of the largest in the world and filling over 1,000,000 barrels a year.

The city has a large German population, which is seen in the many foreign signs met with, and also in the high development of art and music in city circles. The town was settled in 1835, and became a city in 1846. It enjoys a steady and substantial growth, and its financial credit is of the highest. Population in 1900, 285,315.

Mim'icry, the imitative resemblance of one animal to another, or to some inanimate object for which it may be mistaken. This is also called protective resemblance, in-asmuch as animals escape notice through this form of imitation, and are protected from their enemies. A wide range of cases occur in nature. For example, certain insects resemble leaves, others twigs and knots. Animals of the desert have a color merging into their surroundings; many animals, like lizards, adapt their colors to their surroundings, and thereby escape observation. Color resemblance is also carried further. Certain butterflies and caterpillars are not eaten by birds on account of their unpleasant taste. The birds learn to distinguish them by their bright "warning" colors and to leave them alone. Other forms, without noxious taste, imitate these colors and escape. A harmless animal sometimes imitates a stinging or poisonous one and is shunned. The animals protected in these various ways are, as a rule, unconscious of their imitation. Protective mimicry may be an important factor in the preservation of species. See Poulton's *The Colors of Animals* (1893).

Mindanao (*mĕn-dä-nä'ō*), the most southeastern of the Philippine islands, next in size to the island of Luzon, containing, it is estimated, 37,000 square miles. The population of that portion under Spanish domination was given by the last census made under the Spaniards as a little over 200,000; but the natives claim a population of twice that number outside the boundaries reached by the Spanish authorities. The surface is broken into high mountains, reaching in the case of Apo, a volcano near the gulf of Davao, an altitude of over 10,000 feet. The wet and the dry seasons shift from the one side of the island to the other according to the direction of the prevailing winds. The island is densely wooded with timber of great value, and the tropical fauna is varied and abundant. The inhabitants are greatly divided in origin, temperament, and religion. The interior parts of Mindanao are held by wild tribes of Malayan race, or by the small, black Negritos with whom they have intermarried. The Jesuits, who knew most about the island before the American occupancy, divided the people into twenty-four distinct tribes, of whom seventeen were pagan, six Mohammedan (Moro), and the remainder Christian Viasayans, who came in from the north. The warlike Moros are most dreaded, and, living along the frequented coasts, have held command of all important points. The rivers of Mindanao are larger and longer than those of Luzon, the Butan practically traversing the whole island from south to north. The soil is productive beyond exaggeration. Gold is believed to exist in the mountains. The capital of the province is Zamboanga, large and clean, with a pier extending out into moderately deep water. This island was the first of the group to be discovered by Magellan in 1521.

Mindoro (*mĕn-dō'rō*), one of the Philippine islands, containing, it is estimated, about 4,500 square miles. It lies directly south of Manila bay, having for its capital Calapan, one hundred and twenty miles from Manila. It was formerly inhabited by the Tagalogs, but various expeditions of the Moros have greatly reduced the number of the native population. Others died from cholera and fever, some years ago, when an epidemic among their herds carried off all their buffaloes and rendered cultivation of the soil no longer possible. The once rich rice fields have for the most part gone back to the condition of a tropical wilderness. In the interior of the island are mountains attaining a height of 8,000 feet. The native races still in these mountain fastnesses are greatly distrusted by those nearer the coasts. The population is supposed to be in the neighborhood of 15,000; but dread of the Sulus has kept the native races so far from the sea that but little is really known about them.

Min'eral Oil. See PETRO'LEUM.

Mineral'ogy, the science which treats of minerals, does not embrace all that relates to the mineral kingdom. Simple minerals alone are regarded as the subjects of mineralogy; rocks, formed by the aggregation of simple minerals, and their relations to each other are the subjects of petrology (the science of rocks) and geology. Mineralogy considers the composition, structure, formation, and classification of minerals.

PHYSICAL MINERALOGY embraces the outside form (generally shown by crystallization) of minerals and the other physical characteristics of each of the different species, such as specific gravity (relative weight), luster, hardness, fusibility, optical properties, and color. The latter is usually variable, and hence not characteristic of a mineral.

CHEMICAL MINERALOGY considers the character of minerals as chemical compounds, embracing also methods of using chemical tests as an aid in this determination.

DESCRIPTIVE MINERALOGY shows the classification of minerals and a description of the various species and their varieties as found in nature.

Although the ancients recognized many of the gems, and the minerals containing the useful metals, their knowledge of mineralogy was very crude. It was not until the development of modern chemistry, about the begin-

ning of the 19th century, that minerals began to be properly studied and classified.

In 1820, Mohr, of Vienna, presented a system of grouping minerals upon their similarity of form, taste, luster, gravity, streak, hardness, etc. In the methods now in use in this country, the system of Mohr is very largely followed, with additional aid from blowpipe examination and simple chemical tests. When new species are being described, the chemical analysis and the determination of the crystalline form must be very complete. A mineral species always has a definite chemical composition which varies only within certain limits, and, if it crystallizes at all as most minerals do, it has always the same general form. When a substance crystallizes in two distinct forms in nature, these are looked upon as different minerals and are given separate names.

Minerals vary greatly in hardness from soft substances that may be scratched with the finger-nails, like gypsum, to the hardest stones, as the sapphire and diamond. The same wide difference exists as to their color, even in the same species, as, for example, in the mineral tourmaline, which exhibits different shades of brown, blue, green, red, and is sometimes colorless, and frequently black and opaque.

The study of minerals has led to the development of the science of *crystallography*, but most chemical compounds (see CHEMISTRY) that are prepared artificially are also capable of forming crystals, and crystallography is applied to them as well as to the natural substances.

All the minerals that crystallize, as well as all artificial crystals, may be arranged in six groups or systems, according to the relation of the faces to certain imaginary lines passing through them, termed axes.

The Isometric system has three axes, all at right angles to each other, and of equal lengths. A familiar example is fluorspar, which usually occurs in cubes.

The Tetragonal system has three axes at right angles, but one of them may be of varying lengths as compared with the other two. The mineral zircon crystallizes after this form.

The Orthorhombic system has three axes at right angles, but all unequal. Stibnite or antimony sulphide belongs to this system.

The Monoclinic system has three unequal axes, two at right angles and one oblique. The common mineral hornblende illustrates this form.

In the Triclinic system, all the axes are of unequal lengths, and at varying angles with each other. A number of the feldspars are classed here.

The Hexagonal system has three axes at angles of 60° with each other, and a fourth at right angles to the plane of the other three. Beryl is a familiar example of this system.

While each mineral species that is crystallized follows its own form of crystallization, there are numerous modifications of the planes and angles of all the systems, giving rise to many complex forms. The molecular arrangement of minerals, which results in their crystalline form, also influences their capacity for transmitting light and heat. The form of the crystals in various minerals is often complicated also by what is termed "twinning," when one or more parts in a crystal are in a reversed position to the other parts. This gives rise to many beautiful and complex forms. The dendritic form of magnetite between two flakes of mica is an instance of such "twinning."

Minerals have doubtless been formed in four principal ways: (1) by the solidification by cooling of molten masses, as, for example, the quartz, feldspar, and mica of granite; (2) by the action of heat upon rocks below the point of fusion, as in the formation of garnets in mica-schists; (3) by the action of water dissolving substances in one place and depositing the same or other compounds in another place, as in the deposition of calcite in veins; (4) by the action of volcanic gases, which, upon cooling or coming in contact with substances with which they act chemically, deposit certain minerals. It is not always easy to decide in what way a given mineral has been formed, and it is evident that certain minerals may be deposited in more than one way.

An interesting and peculiar condition of some mineral species is what is known as "pseudomorphism," where one mineral is replaced by another which usually retains the form of the original crystal. This arises from the substitution of one mineral for another, as, for instance, smithsonite after calcite. Here the calcite crystals seem to have been gradually dissolved, while the smithsonite replaced them. Petrified wood, which is common in many places, occurring in Arizona in the shape of whole forests of silicified tree trunks, is an example of pseudomorphism. Here the action has evidently been from the infiltration of water charged with silicic acid through the beds in which the forests were buried and as the original wood decayed or was dissolved away, the silica, in the form of rough opal, took its place.

Dana's *Treatise on Mineralogy*, as revised to the present time, may be considered to be the standard for descriptive mineralogy. Brush and Penfield's *Blowpipe Analysis* is the most elaborate work on determinative mineralogy. Mineralogy in the United States, as bearing upon ornamental and precious stones, has been lately dwelt upon in detail in *Gems and Precious Stones of North America*, by George F. Kunz. H. L. W.

Min'eral Waters are, strictly speaking, waters impregnated with mineral solutions by natural processes; but the term is commonly applied to all waters which possess real or even fancied therapeutic value other than that of ordinary water. In consequence "hot

springs" are often spoken of as "mineral springs" when used for medicinal purposes. The ancients had great faith in all waters which felt or tasted other than the common "springs which run among the hills." Josephus mentions the visits of Herod to the warm baths of Calirrhoe near the Dead sea. Tiberias was famous for its springs of hot sulphur water. The Romans frequented the gaseous springs situated in southern Italy, much visited by tourists to-day. The springs of Karlsbad, Aix-la-Chapelle, Baden-Baden, and Ems are well known. In our country, Saratoga has been a resort ever since the settlement of the state of New York, and its popularity is to-day greater than ever. White Sulphur Springs, in Virginia, have rivaled the northern spa in the favor of the people. It is impossible to divide the springs into any well-defined classes as "salt springs" often contain sulphur, and "alum springs" may hold in solution a dozen other minerals besides the one giving the water its name. The best known springs, those at Saratoga, contain more of chloride of sodium (common salt) than of any other or all other mineral substances, bicarbonate of lime standing second, and bicarbonate of magnesia third. It is the presence of carbonic acid gas which gives to these springs their delightful effervescence. The value of mineral waters sold in the United States amounts annually to over $5,000,000, which amount is sure to be greatly increased as facilities for handling the product are improved. There are in the United States about 300 springs whose waters are bottled and put on the market.

Min'eral Wool is the name given to the thread-like filaments produced by the action of steam or compressed air upon vitreous substances when in a molten state. The product is also called silicate cotton by some, as the principal material in the product is silica. The fibers produced are used to incase boilers and steam pipes, thereby preventing the diffusion and waste of heat. It is also of great value in deadening sounds. As it will not burn or rust and is not subject to the depredations of insects, it is of great value in many mechanical adjustments and its use increases every year. The best mineral wool is obtained from the melting of a cinder made by mixing together four parts of orthocase feldspar and six parts of dolomitic limestone.

Miner'va, in Roman mythology the goddess of wisdom. She seems to be the same as the Greek Athene and Pallas. She was said to have sprung in full armor from the head of Jupiter. She was the patron god of Athens, and her statue by Phidias adorned the Parthenon. In her hand she carried the spindle, needle, and spool, and was skilled in all kinds of woman's work. She was patroness of art and trades; painters, teachers, and physicians invoked her aid. Minerva, like Athene, is represented in art with a grave and majestic countenance, armed with helmet, shield, and spear. The olive branch, the serpent, and the owl, were sacred to her. Her festival, held in March, lasted from the 19th to the 23d.

Minie (*me-ne-ā'*), **Claude Etienne,** a French inventor, born at Paris, in 1804. He served in the army, rising from the rank of a private soldier to that of major. His experiments in the improvement of firearms resulted in the invention of the Minié rifle in 1849. He made improvements also in rifle balls, cartridges, and gun barrels. In 1858, he was appointed director of a military school at Cairo, Egypt, by the khedive. He died in 1879.

Min'ing, the process by which mineral matters of commercial value are taken from their natural position and made available for shipment. The substances mined consist not only of metals and the ores of metals, but of various non-metalliferous substances, such as coal. In the broadest sense of the term, mining may also be made to include the winning of such subtances as natural gas, mineral oils, clay, building stone, natural fertilizers, salt, etc., though other terms are commonly applied to the processes by which these substances are made available.

Occurrence.—The materials mined occur in various forms, chief among which are (*a*) bedded deposits chiefly beneath the surface, (*b*) vein deposits, and (*c*) surface deposits.

(*a*) Bedded deposits include (1) such bodies of valuable mineral matter as lie in beds essentially parallel to the associated layers of rock, and (2) deposits which are disseminated through stratified rocks. Examples of (1) are many iron and all coal beds. An example of (2) is the copper in the conglomerate beds of the Lake Superior region. The former (1) are really layers of rock, formed later than the rock which lies below them, and before that which lies above. The second group (2) are usually of secondary origin; that is, the valuable mineral matter was concentrated where it now is, after the rock was formed.

(*b*) Veins are the fillings of cracks or fissures in rock. The filling is generally accomplished through the agency of underground water, which dissolved the mineral matter from the rock, brought it to the fissures and there deposited it. Veins are called mineral veins, or often "lodes,' if the material is valuable for commercial purposes. The walls of veins are often impregnated with useful mineral matter like that of the vein proper, and the term "vein" is then made to cover those parts of the walls which contain the valuable matter, as well as the vein itself. Veins differ from bedded deposits in that they are usually more irregular, less continuous, and have no definite relation to the bedding planes of the rock. Both bedded and vein deposits may be horizontal, vertical, or inclined at any angle. Bedded deposits

were usually horizontal to begin with, but the beds of ore, coal, etc., may have been tilted the same as the beds of rock above and below. Veins likewise occur in any position, depending on the direction of the fractures in which the vein stuff was deposited.

(*c*) The third class of ore deposits is represented by gravel, sand, or earthy material, in which there is some useful mineral which can be extracted with profit. Thus, certain deposits of sand and gravel, like those of Cape Nome, and various mountain valleys of the western part of North America, contain gold. Tin ores sometimes occur in the same way. In such deposits, mines are opened. The specific gravity of both gold and tin is much higher than that of the associated sand and gravel, and this fact is taken advantage of in mining. Running water is caused to flow over the gravel and sand, with a current which can be regulated. It washes away the lighter material, leaving the desired metals or ores behind. This is the principle of the method known as *placer mining*. Mines in these loose surface materials are *placer mines*. Certain other surface deposits are mined, but in a very different way. Thus, in certain marshes and bogs, bog iron ore accumulates. This is, in reality, a bedded deposit, but is of recent origin, and not buried beneath later beds of rock or sediment. If worked at all, the ore is taken out bodily. Bog iron ore is at present but little used.

The Problems of Mining. — After the existence of valuable deposits of mineral matter has been determined, many conditions affect the method of mining it. These conditions are so complex that they must be considered individually in the case of each mine. In each case the methods must be adapted to the local situation. The aim is always to extract the maximum amount of ore with the minimum expenditure of time and money, and with the least danger to life and property. The first things to be determined are: (1) the shape and position of the ore body; whether it is in distinct beds or veins, or disseminated through a large mass of rock; whether the veins or beds are horizontal, vertical, or oblique, etc.; whether it is near the surface, far from the surface, or both; (2) the extent of the ore body; (3) the character of the ore itself as regards hardness, tenacity, etc.; (4) the nature of the rock in which the ore occurs, so far as concerns its hardness, texture, structure, etc.; (5) the topography of the immediate locality where the mine is located. Questions of another sort, such as facilities for transportation both to and from the mine, water supply, fuel supply, etc., have to be considered in connection with every mine.

Various means are employed for the determination of the exact position of the ore body. This is the work of exploration. Exploration is carried on partly by sinking small test pits; partly by "stripping" the loose material from the surface, exposing the rock which contains the substance to be mined; partly by shafts sunk into the rock; partly by the help of the compass, as in the case of magnetic iron ores; and partly by means of drill holes. In each case, the methods of exploration best fitted to the situation should be adopted. The test pits are very much like open, shallow wells. The stripping of the surface is the method often adopted where the mineral vein comes to the surface of the rock, but is covered by soil and other loose débris. Vertical shafts are often sunk alongside the vein, and tunnels or cross-cuts are then run from the shaft across the vein. Veins are often cross-cut in this way in many places, by way of exploration. The drills which are used in preliminary tests are hollow iron tubes having an inner diameter of one or two inches. In the "bit" at the lower end of the tube, diamonds are set. With the bit resting on the surface of the rock to be drilled, the tube is made to rotate at high speed, and cuts its way down into the rock. A cylindrical core of rock appears in the tube, or "core barrel," as the drill descends. Water is constantly pumped down the inside of the tube, and rises between the drill rods and the wall rock, washing up the fine grindings of the drill. With the drill it is possible to obtain specimens of the rock at various depths, and this is often of value in the further work of the mine. Drill holes have been made several thousand feet deep. This method of exploration is expensive, but effective.

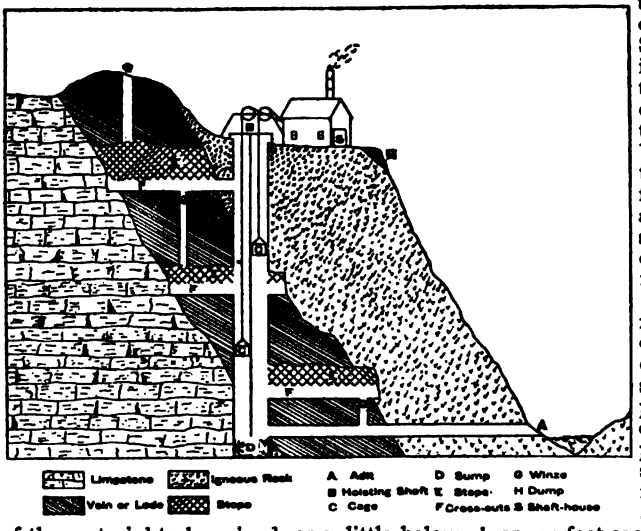
Another problem with which the miner has to deal is the approach to the ore body. Roughly speaking, mining methods may be divided into two general classes: (1) surface mining or "open work," and (2) underground mining.

Open work is done where a small amount only of worthless material must be removed in order to uncover the deposit. This method is employed, for example, in the iron mines in the Mesabi range in Minnesota, where the ore is covered only by glacial drift, 10 to 100 feet thick. Such covering may often be stripped off with steam shovels. Where the ore is soft and friable, as in the case of some of the iron ore of the Mesabi range, it too can be removed by steam shovels; but if the material to be mined is hard, it is blasted and taken out in masses.

In underground work, the cheapest and easiest method, if the topography and the position of the material to be mined permit, is to approach the ore by tunnels. This may be done where the ore body lies in the side of a hill or mountain, so that it may be approached from the side. If the ore can be taken out through a tunnel, it saves the expense of hoisting it up through a shaft. The tunnel often also saves the expense of pumping out the water, which is often a troublesome factor in mining. In many cases,

however, it is necessary to approach the ore by a shaft. The shaft may be either vertical or inclined, according to local conditions, and especially according to the position of the ore body. The inclined shaft is sometimes known as an "incline." A shaft is usually rectangular in section. In very small mines, it may be no more than four feet square, but in large mines the shafts are much larger, large enough to permit the working of at least two hoists, called "cages" or "skips." There must also be room for pipes, both for carrying down compressed air and for the carrying out of water. Large mines frequently have shafts as much as 12 x 18 feet in diameter.

If the material to be mined lies in a horizontal bed, the shaft is sunk down to the level



of the material to be mined, or a little below. Tunnels are then made, leading sidewise from the shaft into the substance to be mined. The material to be mined is worked out along these tunnels, carried to the shaft and hoisted to the surface. When the material which is being mined is worked out, it is often necessary to put in timbers to keep the mine open. If, for example, a horizontal bed of coal is being mined, the taking out of the coal leaves the rock above unsupported. Timbers may be put in to hold up the roof, or columns of coal may be left here and there, to serve the same purpose. Where practicable, the tunnels driven from a shaft are made to rise slightly from the horizontal, so that the water encountered in the tunnel may drain into the "sump" or pool at the bottom of the shaft. From the sump it is pumped out. The slight inclination of the tunnel also facilitates the transfer of the substance mined to the shaft. If the tunnels are parallel with a mineral vein, they are called "drifts." When they cut the vein, they are called "cross-cuts." "Tunnel" is a rather indefinite name which may be applied either to drifts or cross-cuts. The process of drifting and cross-cutting is called "driving a level." Tunnels are usually as much as 6 x 6 feet in section. Tunnels are often run at various levels; for example, tunnels may be run at the 50-foot level (that is, 50 feet below the surface), at the 100-foot level, at the 150-foot level, and so on. When the drifts and cross-cuts have been made, and the different levels put in communication by vertical shafts, the ore between the various openings is said to be "blocked out."

Some ore has been extracted in the process of blocking out the ore. When a body of ore has been blocked out, its extraction begins in earnest. The processes employed for loosening the substance to be mined are various. Sometimes it is loosened by the pick, or by other sort of hand-tool. Sometimes it is already soft or incoherent. Often it is so hard that it must be blasted. Ore is often worked from below rather than from above. That is, ore between the 50 foot level and the 100 foot level, is often worked from the latter, and carried along it to the main hoisting shaft. The working out of the ore between levels is "stoping."

Another problem which the miners have to encounter is the drainage of the mine. In most deep mines the amount of water seeping in is great, and must be pumped out about as fast as it enters. For this purpose force pumps are used. In deep mines several or many force pumps may be needed. Pumps which are able to elevate the water 300 or 400 feet each are in common use. In mines near deep valleys, it is sometimes possible to secure drainage by driving a drainage tunnel or "adit" from the shaft to the valley.

Still another problem which has to be faced in mining is that of ventilation. In coal mines where noxious gases are sometimes plentiful, in mines where many men are at work, in mines where there is much blasting, and in deep mines where the temperature is high at the bottom, ventilation is of the utmost importance. Ventilation may be either natural or artificial. In shallow mines the hoisting shaft is usually large enough for ventilation. If there are several shafts connected with one another, the circulation of the air in the mine is facilitated. If there is an adit, it helps still further. Artificial circulation is secured by fans placed at the entrance of mines, or by the use of compressed air which is carried into the mine. Compressed air is often introduced for power, and as it escapes it serves for ventilation as well.

TRANSPORTATION.—When the material to be mined has been loosened from its natural position, it is carried to the main gangways in barrows, chutes, or cars. In the main gangways are tramways. The cars are of iron or wood, with wheels close enough together so that the cars can be run on short curves. The motive power is furnished by men, mules, steam engines, or electricity. In vertical shafts the material is hoisted in buckets or "cages." In inclined shafts, the hoisting is done with "skips." The skips are on wheels, the rear wheels being much larger than the front ones, and when the skip reaches the horizontal dumping platform at the top, the forward pitch dumps the ore automatically. The hoisting power, in the case of large mines, is steam or electricity.

ORE DRESSING.—In most instances the ore must be subjected to a preliminary treatment before it is fit for metallurgical processes. The method of treatment varies with the ore. In many cases the masses and lumps of ore are crushed, or even ground to powder, often by the pounding of huge hammers in a stamp mill. The valuable part of the ore is then separated from that which is without value, the process of separation being different in different cases. Where the ore is much heavier than the waste, the separation is brought about through differences in specific gravity. The final extraction of the metal, like the preliminary treatment of the ore, differs with the nature of the ore. Gold, for example, is passed over a copper plate coated with mercury. The mercury forms an amalgam with the gold, and is afterward separated from it by heating until the mercury is volatilized. At this stage the product passes from the hands of the miner to the hands of the metallurgist. Ores of other metals are treated by other processes. The concentration of the crude ore is "milling." Under this term, the extraction of the metal from the ore is also sometimes included. Properly speaking, the process of mining ceases when the ore is ready for the mill, or for shipment.

R. D. SALISBURY.

Mink, a carnivorous animal valued for its fur. It is related to the weasel, but is stouter in the body and has a more bushy tail. It is adapted to a life in the water, but also lives partly on land. Minks make burrows and nests in the banks of streams. They feed on fish, reptiles, mollusks and crustacea, and also on muskrats, rabbits, etc. The American mink is fifteen or twenty inches long, with a tail of eight or nine inches. It is widely distributed in North America in places suited to its mode of life. Its color varies from light yellowish-brown to rich blackish-brown. The darker the color the more highly prized is the fur. The European mink is a little smaller than the American mink, and is more northern in in its range. The Siberian mink has fur of a clear tawny-brown color.

Min'neap'olis, a city of southeastern Minnesota, is situated on both sides of the Mississippi river, about seven miles from St. Paul, though the interval between is so built up as to make them really one city. The name is from the Sioux word "Minne," meaning water, and the Greek word for city. The falls of St. Anthony, with a descent of sixteen feet, furnish the water-power which has built up the city. The Mississippi is crossed by twelve bridges.

Minneapolis is one of the most enterprising and important of the younger cities of the United States. Its rapid growth is shown in the fact that from 46,887 in 1880, the population advanced to 202,718 in 1900. The basis of growth is found in the location of the city with reference to the great wheat and lumber interests of the northwest. It is the greatest primary wheat market of the world. The wheat product of Minnesota is greater than that of any other state in the Union. More than half of this is here manufactured into flour, while not only the product of Minnesota, but a large part of the yield of the great fields of the Dakotas finds a market here. A single one of the great flouring mills of the city has a capacity of 25,000 bushels per day. The elevators of the city have a storage capacity of about 20,000,000 bushels. The great timber industry of the upper Mississippi valley finds its chief market and manufacturing center in Minneapolis. All the great trunk lines of railroads in the northwest run to or through Minneapolis, giving to the city unexcelled transportation facilities. Among the notable buildings are the Chamber of Commerce, the Exposition building, the Lumberman's Exchange, the West hotel, and others. Here are located the University of Minnesota, Hamline university, Augsburg Theological seminary, and Macalester college, besides several seminaries and professional schools. The public schools are of high grade, efficiently organized and well equipped. There are 60 school buildings; the teaching force numbers 853; and there are 37,532 pupils enrolled.

Minneha'ha, Falls of, are near Fort Snelling, about five miles from Minneapolis on a little stream flowing from Lake Harriet and Lake Calhoun. They are 59 feet high, and though not a large body of water, the spray and sparkle of the waters together make it deserve the name "laughing water," which is the meaning of the word. Longfellow has made it famous in his *Hiawatha.*

Minnesingers (*min'e-sing-ers*), a name applied to the lyric poets of Germany who flourished from the middle of the 11th to the close of the 13th centuries. They, however, not only wrote the poetry, but composed the music for their love songs. They sang mostly of love, as the word "minne" indicates, and often roamed from castle to castle, and from court to court, like the troubadours reciting or singing their songs. The chief exponents

of this feudal verse are Walther von der Vogelweide and Wolfram von Eschenbach. The songs of 160 of these singers are preserved. After the decline of their art, the Meistersingers took their place. Unlike the Minnesingers, who were of the knightly or courtier class, the Meistersingers were men of the artisan class, and formed themselves into guilds and wrote poems as they plied their tasks. Though there is little real poetry in the songs of the Meistersingers, they were popular for three centuries, the last guild being dissolved in 1830.

Minneso'ta, a river which crosses the state of Minnesota. It rises near Lake Traverse, on the Dakota border, and widens into Big Stone lake, which stretches for 30 miles along the same border, flows southeast until nearly across the state, then with a sharp turn flows northeast into the Mississippi at Fort Snelling, five miles above St. Paul. It is 450 miles long and navigable for 300 miles.

Minneso'ta belongs to the northern group of states, lying next to Canada. Its land surface is approximately 79,205 square miles, and is larger than Ohio and Indiana. The state contains the sources of the three great river systems of North America. The Red river of the north sets out here for Hudson's bay; the St. Louis river and others, entering Lake Superior, find their way to the Atlantic ocean, and the Mississippi starts from Lake Itasca on its long journey to the gulf of Mexico. The Mississippi travels for 797 miles through Minnesota, now through rapids and falls, as at Sauk Rapids and St. Anthony, and now broadening out into lakes, as Lake Pepin. It is navigated to within 270 miles of its source. Minnesota is a rolling prairie, with few hills, none over 1,200 feet high. Two-thirds of the state lies in the Mississippi valley. In the eastern part is one of the most valuable forests of the west, called the Big Woods, 100 miles long and from 10 to 40 miles wide. The ten thousand lakes of Minnesota, of every shape and size, with wooded islands, and bays and waters filled with choice fish, add to the beauty and wealth of the state. The climate is severe in winter, but dry and bracing, with a light snowfall. The soil is fertile, with extensive swamps in the north, and many acres of land yet uncultivated. The hard spring wheat of the state is the best in the world, while other products are corn, oats, potatoes, and apples. It is also a stock-raising state. The great forests, which still cover half the state, give it an enormous lumber trade; and this source of wealth is guarded by encouraging tree planting, over 30,000,000 trees having been set out on the prairies. The iron mines of the Vermillion range, 100 miles from Duluth, produce ore very rich in iron, and belong to an ore field reaching to the Mississippi. There are large quarries of fine building stone, including the pipe-stone quarry, situated on a ridge, rising 450 feet, and where the Indians came for the red stone that could be easily carved into pipes. Minnesota has 7,303 schoolhouses, with close upon 400,000 pupils. The State university, opened in 1869, is a mile below St. Anthony's falls, with a total number of 3,236 students and 120 instructors. The farm connected with the agricultural college is two miles from the university, and covers 250 acres. Macalester college at St. Paul; Carleton at Northfield; St. John's (Roman Catholic) university at Collegeville; the Parker (Free Baptist) college at Winnebago city; the Augsburg (Lutheran) seminary at Minneapolis; the Gustavus Adolphus (Lutheran) college at St. Peter; St. Olaf college and Hamline university at St. Paul, are a few of the higher institutions of learning. The population, made up of settlers from New England, and foreigners, mostly from northern Europe, — Swedes, Norwegians, Danes, Russians, Icelanders, Lapps, and Finns — with 9,000 Indians of the Chippewa tribe, numbers 1,751,394.

Minnesota was first visited by French fur traders and priests in 1659. The part of the state west of the Mississippi came into the Union by the Louisiana purchase. The part east of the Mississippi had been ceded to Great Britain by France in 1763 and belonged afterward to Virginia, who ceded it to the United States. Fort Snelling was built in 1821. After the Chippewas surrendered their lands east of the Mississippi immigration set in, and in 1849 Minnesota became a territory and in 1858 a state. The capital is St. Paul, population 163,065.

Min'now, the name commonly applied to small slender fishes. The true minnows belong to the family *Cyprinidæ*. They are abundant in the Old World and in North America. Although numerous in species they are difficult to distinguish on account of great similarity. Like birds, the male minnows often put on bright colors during the breeding season, and some kinds have the head ornamented with tubercles. The so-called American minnows (*Notropis*), with upward of one hundred species, are confined to the waters east of the Rocky mountains. Minnows are of importance as food for larger fishes, and they are extensively used as bait by fishermen.

Minor'ca, one of the largest of the Balearic islands in the Mediterranean belonging to Spain. It lies to the north of Majorca island, and is 28 miles long and about 10 miles wide, and covers 284 square miles. It has a rocky coast, with many inlets, and a fertile soil. It has also a great number of ancient remains and stalactite caves. The principal cities are Port Mahon, and Ciudadela. It was ceded to Spain by England in 1802. Population 40,000. See *Balearic Islands*, by Bidwell.

Minotaur (*min'ō-târ*), a Grecian myth, represented as a man with the head of a bull. He was fed with seven youths and seven

maidens, sent from Athens at certain periods, until slain by Theseus with the help of Ariadne.

Mint, a general name of species of the great family *Labiatæ*, but specially applied to the species of the genus *Mentha*, ordinarily recognized by their peculiar fragrance and their clusters of small purple, pink, or white flowers. The genus contains about 30 species, all of them native to north temperate regions, 12 of which are either native or naturalized in North America. Peppermint (*M. piperita*) is the most important species in cultivation, and is one of the most important of plants in the production of essential oils. Spearmint (*M. spicata*) is also cultivated for its essential oil, but this is not so much in demand as peppermint oil. It is spearmint which is cultivated largely for table use in the making of mint sauce and mint julep. The chief regions of peppermint cultivation in the United States are certain portions of Michigan, Indiana, and New York.

Mint, the place where money is coined by the government of a country, though in early times in England the bishops and barons had the privilege of coining. Until the middle of the 16th century, coins were made from pieces of metal cut and hammered. In 1662, the use of the screw or mill became common in England. It was the invention of a French engraver, Antoine Brucher. The gold or silver to be coined is melted and has added to it the amount of copper needed to make it hard enough for use, and is formed into bars. In the United States, the silver coins are one-tenth copper and nine-tenths silver, and in the gold coins one-tenth is an alloy or mixture of silver and copper and nine-tenths gold. The bars are then passed between rollers which flatten them into strips or ribbons of the right thickness. The gold bars are usually rolled ten times before they are thin enough, and the bars of silver eight times. The strips are finally drawn between steel blocks to make them straight. The strips are then cut into pieces of the right size, or blanks, which in the gold coins are weighed by hand before being finished off. If too light, they are sent back to be melted again, and if too heavy the edges are filed off. This is usually done by women, as their delicacy of touch fits them for the work. The blanks are now passed through the milling machine which finishes the rims of the coins, and then into the coining press, where they are stamped with the figures and letters of the different coins. After a careful weighing and inspection and counting, they are put into bags and are ready for circulation. There are in the United States five mints — at Philadelphia, New Orleans, San Francisco, Carson City, and Denver, and several assay offices where the metals are prepared for coinage. The mints are under the direction of a branch of the treasury department, called the bureau of the mint. The earliest money coined in the United States was copper cents in 1795, at Philadelphia, where the first mint was established.

Min'to, Gilbert John, fourth earl of, governor-general of Canada since 1898, and previously known in the Dominion under his junior title of Viscount Melgund, was born in 1845. Early in his career he entered the Scots Guards, was attached to the Turkish army on the Danube in the Russo-Turkish war of 1877, served in Afghanistan in 1879, and two years later accompanied Sir Frederick (now lord), Roberts to South Africa as military secretary. From 1883–86 he was military secretary to Lord Lansdowne, then governor-general of Canada, and chief of staff in a short campaign against the insurgent Riel in the northwest territories of the Dominion. He succeeded to the earldom in 1891, and in 1898, was appointed governor-general of Canada. Residence, Ottawa.

Mirabeau (*mē-rä-bō'*), **Honore Gabriel Riquetti,** Count de, a great French statesman, was born at Bignon, in Provence, France, March 9, 1749. He was badly scarred by smallpox at three years of age, and had one foot twisted, and an unusually ugly face, yet his great ability and a personal power of fascination made him the idol of his companions. His father, a tyrant in his home, placed him in the army and twice secured his imprisonment. His life was wild, and at one time he was condemned to death for his flight with a married woman. While in prison he wrote his famous essay on *State Prisons*. After his release, he succeeded in having the sentence against him repealed, and made himself famous by his eloquent appeal in his own behalf. He spent his next years in writing pamphlets and books, and while on a secret mission of the government at Berlin, obtained the materials for his *History of the Prussian Monarchy under Frederick the Great*. His political life began with the stormy days preceding the revolution; and in the national assembly when the king commanded the deputies to separate, he made the memorable answer, "We shall yield to nothing but bayonets." His dream was to place the king at the head of the revolution and reform the government by a new constitution, guarded by a ministry, somewhat after the pattern of the English parliament. He tried to make terms with Lafayette and Necker, suggesting their names for the new ministry. He labored incessantly and with great power, but was opposed by the queen and mistrusted by the better classes in either party. "The sins of my youth," he bitterly exclaimed, "are giving me their full punishment now." In 1790, he was made president of the Jacobin club and administrator of the Seine department, and later one of its eight directors. In January, 1791, he was made president of the assembly. He

opposed the law against emigration, and the proposal that at the king's death a regent should be elected by the assembly. His health, ruined by his early excesses and his tremendous labors, was failing, and with prophetic foresight he said, "I carry with me the ruin of the monarchy." He died at Paris in his forty-third year, April 2, 1791, and was buried in the Panthéon. "Do not rejoice over the death of Mirabeau," said the king to his wife; "we have suffered a greater loss than you imagine." His was the one influence that might still have saved the throne. See *History of the French Revolution*, by Carlyle; *French Revolution*, by Michelet; *French Revolution*, by Taine.

Mir'acle Plays or **Mys'teries**, were plays performed in the middle ages, the subjects of which were taken from the Bible, or the lives of saints. Miracle plays were founded on legends, and the mysteries on the history of the Bible, but the distinction was not carefully observed. The plays were at first performed in the churches by the clergy and their assistants, but afterward on stages erected in the streets, and at one time every important place had its band of players. The first known specimen of these plays dates back to the 4th century. In 1110, in Dunstable, England, was exhibited the play of St. Catherine, the earliest mentioned in England. They were used at first as means of religious instruction, but became gradually corrupted by jests and vulgarities. After the Reformation they slowly declined, though the first blow against them came from the Catholic church on the ground of their irreverence. The only modern instance of these plays is the Passion Play, which is performed once in ten years at Oberammergau, in Bavaria, as the townspeople pleaded successfully to be excepted from the general condemnation in 1779. (See OBERAMMERGAU.) See *Miracle Plays*, by Hase; *English Miracle Plays, Mysteries, and Moralities*, by Pollard.

Mirage (*mi-rasĥ'*) is an appearance of an object in the sky, or at sea above the water, produced by the rays of light changing their direction when they pass through a layer of either hotter or colder air. The mirage of the desert is thus the effect of the heating of the layer of air next the ground by the hot sands, thus bending the rays of light upward; while over water the effect is produced by the rays of light being bent as they pass from the cool layer of air next the water into hotter air above. Sometimes the object is seen in the sky upside down, occasionally only slightly raised, and sometimes there will be two objects, one upright and the other reversed. These effects are all explained by the different layers of hot and cold air through which the light passes. There have been some very remarkable mirages; such as the "Fata Morgana," in the straits of Messina, where men, houses, and ships are seen, sometimes in the water and sometimes in the air. Captain Scoresby, while cruising off the coast of Greenland, discovered his father's ship by its image or reflection in the sky. In the Baltic sea, in 1854, the English fleet of nineteen vessels, 30 miles away, was distinctly seen floating in the air. See *Optics*, by Brewster.

Miramon (*mē-rä-mōn'*), **Miguel**, a Mexican general, was born in the City of Mexico, Sept. 29, 1832. While still in the military academy, he, with his fellow students, were engaged in defending Chapultepec in the war with the United States, and he was taken prisoner. Entering the army in 1852, he became colonel in 1855, and general when twenty-five years of age. When in command of a body of troops, he headed a rebellion against Alvarez, the president of the country at the time, and took the city of Pueblo, which he twice defended within six months, the second time for forty-three days, against 10,000 besiegers. He kept up his opposition to the government, as the head of the church party, and was finally chosen president, in 1859, but declined the honor, reinstating Zuloaga, who retired in a few days, leaving Miramon in command. The war continued until 1860, when the Liberal party gained power and Miramon fled to Europe. There, Maximilian, to whose fortunes he adhered, made him grand-marshal and minister of Mexico to Berlin. He returned to Mexico in 1866, when Maximilian was reigning, and the latter persuaded him to give up his intention of resigning, and as chief of the army he was captured and shot at Querétaro, with Maximilian, June 19, 1867. See *Mexico under Maximilian*, by Kendall; *Young Folks' History of Mexico*, by Ober; *Mexico and Her Military Chieftains*, by Robinson.

Mir'iam, the sister of Moses, who guarded him when, as an infant, he was placed by his mother in a basket by the river Nile, to avoid obeying the king's command to destroy all the male children. She called her mother as nurse when the babe was found by the daughter of Pharaoh. She is called a prophetess, and her triumphal song at the head of a procession of women, after passing the Red sea, is given in Exodus. Rebelling with her brother Aaron against Moses, she became a leper, but was healed by the prayer of Moses.

Mir'ror, a surface capable of reflecting light. Ancient mirrors, now found in tombs and sepulchral vaults, were made for the most part of solid, highly-polished metal; but upon the use of glass becoming common, that material took the place of heavier substances. The backs of the first glass mirrors were covered with a thin coating of lead, but the glass workers of Venice introduced, in the 17th century, an amalgam of mercury and tin which answered the purpose much better. A solid and perfectly level table of stone is first covered with a sheet of tin-foil, over

which a quantity of mercury is poured, raised edges preventing the loss of the same. Upon this liquid mercury a carefully-prepared plate of glass is slid in such manner as to exclude all air bubbles and all impurities. The superfluous liquid is then run off, and by means of delicate and uniformed pressure the amalgam is made to adhere to the glass. The plate being lifted from its position is turned with the coated side uppermost to dry. This process sometimes requires weeks. Owing to the injurious effects of the vapors of quicksilver upon the health of workmen, the attempt has been frequently made to substitute a continuous film of silver for that of mercury, but the process has been attended with uncertain results. Concave mirrors have been used for focusing the rays of the sun, and a sun-motor has lately been constructed in California, where mirrors arranged in a circle thirty-two feet in diameter are made to generate steam and to pump water into irrigating canals.

Mississippi (*mis-i-sip'i*), the largest river in North America, and, if calculated from its mouth to the source of the Missouri, its largest branch, the longest river in the world. It rises in Minnesota, in Lake Itasca, is 2,960 miles long, or with the Missouri, 4,200 miles, and drains all the country between the Alleghenny and Rocky mountains, a region nearly as large as half of Europe. It has about 16,000 miles of navigable waters. The largest tributaries are the Missouri, Arkansas, Red, White, Yazoo, and Ohio rivers, and, besides these, about 240 smaller ones. There are falls at Minneapolis, Rock island, and Des Moines rapids. The river begins with a width of 12 feet, widening to 4,700 feet below the mouth of the Ohio, and measuring 2,500 feet at New Orleans. It flows, in the lower part of its course, through lowlands, often below the level of the river, and protected by embankments for over 1,600 miles. After receiving the waters of the Red river, the Mississippi divides into many separate channels, called bayous, each making their way to the gulf of Mexico, where it forms what is called the delta. The water of the Upper Mississippi is clear, but gradually grows dark and muddy as the great rivers along its course pour their turbid currents into it. It carries yearly into the gulf enough earth to make a square mile of land 263 feet thick. These great deposits obstruct the mouth, and the government has expended large sums in providing a system of jetties or walls to protect the channel. (See BREAKWATER.) The river from the mouth of the Ohio is subject to extensive floods, the water stretching for miles over the lowlands, many of which are uncultivated because of this danger. The levees or embankments to prevent floods have been extensively built by the United States, and cost a large amount yearly for repairs. The first white man to discover the waters of the Mississippi was De Soto, in 1541, and in 1673, Marquette and Joliet descended it nearly to its mouth, while La Salle sailed to the gulf and took possession of the country for his king, in 1682. See *Physics and Hydraulics of the Mississippi River*, by Humphrey and Abbot.

Mis'sissip'pi, one of the southern states of the Union, lying on the Mississippi river. It covers 46,810 square miles (the total land surface is 46,340 sq. miles), and is 335 miles long and 150 broad — about one-sixth the size of Texas. It has several large rivers — the Yazoo, 264 miles long, flowing into the Mississippi, the Pearl, and the Tombigbee into the gulf of Mexico. The country is hilly, without mountains, except in the Mississippi bottom lands. These lands, lying between the Mississippi and the Yazoo rivers, are protected by levees, the funds for the purpose being raised by a tax on every bale of cotton. The coast line of the state is only 90 miles, and is separated from the gulf of Mexico by the Mississippi sound and a range of low islands. There are several fine mineral springs, the resort of tourists. The state is mainly agricultural, cotton being the great crop, besides corn, oats, rice, and potatoes. Fruits and vegetables of all kinds grow luxuriantly, and are sent to the northern markets. The cotton product is second only to that of Texas. The forests are valuable, covering three-fifths of the land, the most valuable tree being the yellow pine. The winters are mild, the summers hot, though tempered by the gulf breezes. The University of Mississippi, founded in 1848, is near Oxford; the Agricultural college, with an experiment farm, at Starkville; an industrial college for girls at Columbus, Mississippi college at Clinton, and schools for the colored youth at Tougaloo, Holly Springs, and Jackson. The capital is Jackson (population 7,816), the other chief cities being Vicksburg, Natchez, and Meridian. Population of the state 1,551,270, of which more than half is colored.

The first European to pass through this region was De Soto, but he left no settlements. La Salle took possession of the country in the name of France in 1682, calling it Louisiana. In 1699 and in 1716, forts were built on the bay of Biloxi and at Natchez. It was ceded to Great Britain in 1763. The state was organized as a territory in 1798, and came into the Union in 1817.

Missolonghi (*mis-sō-lon'gē*), a town in Greece, built on a swampy flat, and memorable for the sieges through which it passed in the struggle for Grecian independence. In 1821–22, under Marco Bozzaris and Mavrocordato, it held out for three months against the Turks. Again, in 1825, it resisted a large force of Turks for ten months; at last, putting the women and children in the center, the garrison cut their way through the Turkish army, 2,000 of them reaching the mountains. Byron joined the Greeks in their struggle at

Missolonghi, in January, 1824, and died there April 9, 1824. Statues of Bozzaris and Byron have been erected here. Population 10,000.

Missouri (*mi-zō'ri*), a river of the United States, the longest tributary of the Mississippi. The name means the "muddy river." It is so much larger and longer than the Upper Mississippi that it ought to be considered the main river, and so form, with the Lower Mississippi, the longest river in the world. It rises among the Rocky mountains, near the border of Montana and Idaho, its general direction being southeast to the Mississippi, which it reaches, after crossing the whole state of Missouri, near St. Louis. It is 2,980 miles long, and can be navigated for about 2,500 miles. A narrow gorge made by walls 1,200 feet high and only 450 feet apart, called the "Gates of the Rocky Mountains," through which the river flows, is about 400 miles from its source. And 145 miles further down the river are the Great Falls, of four cataracts, 26, 47, 19, and 87 feet high, separated from each other by rapids.

Missou'ri, one of the central states of the Union, lies on the west side of the Mississippi river. It is 280 miles long, and varies from 208 to 312 miles in width, and covers 68,735 square miles, being almost twice as large as Indiana. It is divided into two parts by the Missouri river, which flows 436 miles across the state from Kansas City to St. Louis. The north part is rolling prairie, with forests along the rivers, while the south is hilly, the Ozark mountains being in this part of the state, and reaching 1,500 feet in height, while another ridge in the southeast has many bold knobs, as Pilot Knob and Iron Mountain. Missouri is well watered, having, besides the Mississippi and Missouri rivers on her borders, the Grand Platte, Osage, and the Gasconade. There are in the state a number of curious caverns, many miles long, with hidden lakes and streams and great halls and galleries, adorned with stalactites, and also numerous groups of mineral springs. The climate is marked by extremes, lacking alike the moderating influence and protection of sea air, or sheltering mountains. It is rich in minerals, its iron fields, including Iron Mountain, which covers 500 acres, and Pilot Knob, being almost inexhaustible, and supplying a very rich ore. Lead is found in large quantities, some of the caverns having millions of pounds on their roofs and sides. It yields more zinc than any other state, and has several nickel mines, very large coal-fields, and fine quarries of stone. The soil is rich and places the state third in the value of its agricultural products. Corn, oats, wheat, hay, and fruits are the chief crops. It is surpassed only by California in the production of wine, and is also a large stock-raising country. The manufactures are flour, beer, wine, tobacco, jewelry, shoes, drugs, etc., and there is a large beef and pork-packing business. It has state normal schools, a state university (established in 1839), with an agricultural college and farm, at Columbia, and a School of Mines at Rolla. Washington university, and St. Louis university at St. Louis, Drury college at Springfield, Westminster college at Fulton, William Jewell college, at Liberty, Grand River college, at Edinburg, Missouri Valley college at Marshall, are only a few among the many institutions of the state, and her school fund is the largest of any state in the Union. The population of the state is 3,106,665. The capital is Jefferson City (population 9,964); the other large cities are Kansas City (population 163,752), St. Louis (population 575,238), St. Joseph City (population 102,979), and Joplin (population 26,023). In 1762, France ceded to Spain the territory west of the Mississippi, and St. Louis, founded in 1764, was a Spanish city with Spanish governors until 1804. The territory of Missouri was founded in 1812, and in 1821 a part of it was made into the state of Missouri, though its boundaries were not settled until 1836. The contest over the admission of Missouri into the Union ended with what is known as the Missouri Compromise, which allowed slavery in Missouri, on the condition that it should be permitted in no other state north of 36½° latitude. The state suffered severely in the Civil war, being divided in sentiment and overrun by both armies, but has been very prosperous since.

Missou'ris, a tribe of Indians belonging to the Dakotah family, first found near the Missouri river. They sided with the French against the English in the early struggles for the country. Lewis and Clarke found them in 1805 on the Platte river, numbering about 300. They had left their home in Missouri and joined the Oto tribe, with whom they have since been connected. The United States pays them $9,000 a year.

Mistletoe (*mis'l-tō*), a family of parasitic green shrubs, or herbs, which grow upon woody plants and absorb their sap by means of special sucking organs known as haustoria (which see). There are over 20 genera and 500 species, which are widely distributed, but most abundant in the tropics. The mistletoe of Europe is *Viscum album;* while the common American mistletoe is *Phoradendron flavescens*, a small, shrubby, brittle form of yellowish color and with white berries, growing in bunches on deciduous trees of various kinds. The mistletoes, which grow in abundance upon various species of conifers, especially in the western mountain regions, are species of arceuthobium, which are greenish-yellow and brown, and with small scale-like leaves.

Mitch'el, Ormsby MacKnight, an American general and astronomer, was born in Kentucky, Aug. 28, 1810. He was professor of mathematics at West Point for two years

after his graduation there; practiced law and taught in the Cincinnati college. He became director of the Cincinnati observatory, which had been built largely through his influence, and also of the Dudley observatory at Albany. In the Civil war he entered the army as brigadier-general of volunteers; was promoted to the rank of major-general, and, after various successes, given command of the department of the south, but died of yellow fever at Beaufort, S. C., Oct. 30, 1862, before entering on the campaign. He lectured on astronomy, and invented several instruments for astronomical work. His published books are, *Planetary and Stellar Worlds*, and *Popular Astronomy*.

Mitch'ell, Donald Grant, American novelist and essayist, was born at Norwich, Conn., April 12, 1822. His college course was taken at Yale college, and his law studies in New York city. He wrote under the name of "Ik Marvel." In 1853, he was appointed United States consul at Venice, and in 1868 became editor of the *Atlantic Monthly*. His best-known works are, *Dream Life*, *Reveries of a Bachelor*, *My Farm at Edgewood*, *Wet Days at Edgewood*, *Doctor Johns*, and *English Lands, Letters, and Kings*.

Mitch'ell, Maria, an American astronomer, was born at Nantucket, Mass., Aug. 1, 1818. She helped her father, who was a teacher, in his work in astronomy, and soon became fitted to make investigations for herself. In 1847, she received a gold medal from the king of Denmark for the discovery of a comet. She was employed in observations connected with the coast survey, and in compiling the nautical almanacs. She was the first woman made a member of the American Academy of Arts and Sciences. In 1865, she became professor of astronomy at Vassar college, holding the position until her death at Lynn, Mass., June 28, 1889.

Mitch'ell, Silas Weir, an American physician and writer, was born at Philadelphia, Pa., Feb. 15, 1829. His earliest researches were in the study of poisons, and he became an authority on the venom of snakes. His later work has been in the study of diseases of the nerves, and he stands at the head of the profession in that department of medical science. He has published, in connection with others, *Gunshot Wounds and other Injuries to the Nerves*, and *Injuries to the Nerves and their Consequences*, and has made many contributions to medical journals. In another line of literary work he has published two volumes of poems and several novels, the more notable of the latter being *Hugh Wynne*, and *The Adventures of François*.

Mit'ford, Mary Russell, an English writer, was born in Hampshire, England, Dec. 16, 1787. On her tenth birthday her father bought her a lottery ticket, which drew a prize of $100,000. This money was extravagantly spent, lasting only long enough to give her a good education. She had to write to support the family, and wrote for magazines, and plays for the stage, having earlier published a volume of poems. Her best work was the sketches she wrote of the life around her, which appeared first in the *London Magazine*, and were collected in five volumes under the title, *Our Village*. She also published, *Recollections of a Literary Life*, and a story, *Atherton*, but her fame depends upon the charming sketches. She received a pension from the government, which made her comfortable in her cottage, where she spent the remainder of her life, the center of a large circle of literary friends. She died Jan. 10, 1855. See *Life*, and *Friendships of Mary Russell Mitford*, by L'Estrange.

Mithridates (*mith-ri-dā'tēz*) **the Great,** a king of Pontus (120–63 B. C.), Armenia, and Parthia, countries in Asia Minor. He became king when about thirteen years old, near the year 120 B. C. The first Mithridatic war, as it is called, was against Bithynia, whose king was sustained by the Romans. At first, Mithridates conquered the Roman provinces in Asia Minor, and sent large armies to help the Greeks, but finally had to make peace with Sulla, giving up all his Asiatic conquests. In the second war, 83–81 B. C., Mithridates was successful, but was again defeated in the third war, which he carried on against the Romans, from 74 to 60 B. C., Pompey finally driving him to his northern territories. Here he planned revenge, but was prevented from carrying out his purpose by the rebellion of his son, when in desperation he ended his life by suicide, in 63 B. C. He was one of the strong eastern despots, well educated, speaking all the twenty-two languages in use among his subjects. He in his day made a fine collection of gems, pictures, and statues.

Mito'sis. See KARYOKINESIS.

Mivart (*miv'art*), **St. George,** an English naturalist, was born at London, Nov. 30, 1827. He was educated at Kings college, and at the age of seventeen entered the communion of the Roman church. He after this continued his studies at St. Mary's college, Oscott. For some years he practiced law, but in 1863 took his degree as a doctor of medicine at St. Mary's hospital. He also studied at Louvain and was appointed professor of biology in University college, Kensington. In both St. Mary's and Louvain he lectured upon scientific subjects. He attempted to establish harmony between the teaching of the schools and his church, but was finally excommunicated and died, cut off from the sacraments, at London, April 1, 1900. His chief publications were *Genesis of Species*, *Elementary Anatomy*, *Man and Apes*, *Contemporary Evolution*, *The Cat*, *Nature and*

Thought, *Types of Animal Life*, *The Origin of Human Reason*, etc. In the main he agreed with Darwin, although working independently of him, and at times he was considered to be radically in opposition to some of the theories of the later Darwinian school.

Mo'abites, a semitic people who lived in the country east of the Jordan and the Dead sea, their land being divided by the river Ammon. They were subject to the Jews in the time of David, but revolted about 850 B. C., and joined the Chaldees against the Jews. They are now lost in the Arab tribes of the region. Their country contains many rude stone monuments, such as have been found in the British Isles, supposed to be the altars of their worship. A large stone with an inscription of thirty-four lines, in Hebrew-Phœnician letters, was found in 1868 among the ruins of the ancient city of Dibon. It was broken by the Arabs, but subsequently was carefully put together and placed in the Louvre at Paris. It is the record of the revolt of Mesha, king of Moab, who is mentioned in 2 Kings III., against the king of Israel. See *Heth and Moab*, by Conder, and *Records of the Past*, by Neubauer.

Mobile (*mō-bēl'*), a bay on the coast of Alabama, about 30 miles long and 10 or 12

miles wide. The entrance from the gulf of Mexico is only three miles wide, and is guarded by Fort Morgan and Fort Gaines. It has also an outlet on the southwest, used by small steamers running between Mobile and New Orleans. The upper part of the bay is shallow, and is becoming more so all the time from the sediment left by the rivers flowing into it. There are three lighthouses on its shores. One of the great naval battles of the Civil war between Admirals Farragut and Buchanan was fought (Aug. 5, 1864) on the bay of Mobile.

Mobile', the only seaport of Alabama, is situated on the west side of the Mobile river, at the head of Mobile bay. It is built on a sandy plain, rising gradually from the river, with broad streets, shaded with live oaks and magnolias. It has a large cotton and timber trade, and manufactures cottonseed oil, chewing gum, cigars, and leather. Its public buildings include a city hall, market house, cathedral, and a Catholic college in the neighborhood. Mobile has been successively a French, English, Spanish, and American city. It was the capital of the colony of Louisiana under the French until 1723, when New Orleans became the seat of government. In 1763, the lands east of the Mississippi, including Mobile, were ceded to England, and in 1783 the British possessions on the gulf of Mexico were yielded to Spain, which kept possession until 1813. Population 38,469.

Mobile', a river in the southern part of Alabama, formed by the union of the Alabama and Tombigbee rivers. The name is that of the Indian tribe living in the region when first settled by whites. The river divides into two branches, the western one taking the name. These two streams after several more divisions all unite and flow into Mobile bay. The river is 45 miles long.

Moccasin (*mŏk'a-sĭn*), a very poisonous snake of the southern United States. It belongs to the rattlesnake family, but the tail is short, and ends in a horny point, instead of a rattle. The water moccasin is the most dreaded snake of the United States. The rattlesnake strikes only when disturbed, and gives warning by its rattle. The moccasin strikes without warning at anything that displeases it. It is an expert swimmer. Often it lies on bushes overhanging streams, watching for frogs and fish. It occurs from North Carolina to southern Illinois, Arkansas, and south. Its closest relative is the copperhead, or upland moccasin, commonly called the cotton-mouth.

The name also of a shoe (Algonquin *mok-i-sin*) worn by the Indians of North America. It is made, sole and upper, of deerskin, or other soft leather, and is ornamented on the top with beads of various colors.

Mockingbird (*mŏk'ing-bird*), a singing bird of the thrush family closely related to the catbird. There are several species found in South America, the West Indies, and the United States. That of the southern United States is best known. It ranges across the country to California and south into Mexico. In the summer, it is found in small numbers as far north as Massachusetts. It is about the size of a song thrush, with the upper parts dark brownish ash in color, the wings and tail nearly black, and the under parts brownish white. It is a fine singer, and during moonlight nights while nesting, will sing all night. Its natural song contains many notes similar to those of other birds, though its powers as an imitator have been exaggerated. Besides

imitating the sweet tones of the wood thrush, it whistles, makes sounds like a creaking wheelbarrow, the barking of a dog, the squeak of a hurt chicken, etc.

Modena (*mŏd'ā-nȧ*), a city in northern Italy, capital of the province of the same name, twenty-three miles from Bologna. It is surrounded by walls, which have been made into fine walks. The square tower of the Gothic cathedral, begun in 1099, is one of the great towers of Italy. The palace, built in the 17th century, contains the Esté library of 90,000 volumes, and a large collection of the works of Guido, Correggio, the Caracci, and other Italian masters, among them a reclining figure of Cleopatra by Canova. The University of Modena, one of the most famous in Italy, founded in 1678, has an academy of science and art, an observatory, a botanic garden, and a military school. It has forty-five teachers and 435 attendant students. The trade of Modena is in farming products, and its manufactures of silk, leather, cast metals, and vinegar. Modena was first an Etruscan city, and was taken by the Gauls, Romans, Goths, and Longobards. Constantine the Great destroyed it; Charlemagne made it the capital of a line of counts; and the Esté family ruled over it from 1288. The duchy of Modena became a part of the Italian kingdom in 1860. Population of the city 68,195.

Modjeska (*mod-jes'kȧ*), **Helena,** a Polish actress, was born at Cracow, Austria, Oct. 12, 1844. From 1868 to 1876, she was the first actress of Warsaw, where she made the plays of Shakespeare popular. She tried farming in California, but failing in her enterprise, returned to the stage in 1877, and won a complete success in San Francisco, though she acted in English, a language she had used for only seven months. She is acknowledged to be one of the best of modern actresses, especially as "Juliet," "Rosalind," "Mary Stuart," "Camille" and "Cleopatra," in which characters she has obtained her greatest reputation, both in the United States and in Great Britain.

Modocs (*mō'doks*), a tribe of American Indians, formerly living in northern California, near Lake Klamath. Their houses were pits, roofed with wooden slabs, and covered with earth. They had several contests with the white settlers, and finally in 1855, 41 out of 46 of their warriors were treacherously murdered by the whites, when invited guests at a feast. This treachery they never forgot, and became bitter enemies. In 1864, after many contests, they ceded their lands to the United States, and agreed to go on a reservation, but the reservation was not given them until 1871, and they lived on the Klamath lands, where their provisions were destroyed, they were cheated out of government supplies, and harassed by the Klamaths. A part of the tribe, under a chief called Captain Jack, returned to their old home, but were ordered away by the United States troops. They repulsed the troops, and retreated to what is known as the lava beds in the mountains, in the fall of 1872, where they defended themselves against repeated efforts to dislodge them until the summer of 1873. Their chiefs were executed, and the rest of the band were carried to the Indian territory. Those who had not taken part in the war remained at the Klamath agency.

Moff'at, Robert, a Scottish missionary, was born in East Lothian, Scotland, Dec. 21, 1795. In 1816, he sailed for South Africa, under the London Missionary society, and began his work in Great Namaqualand, in the country of a chief called Afrikaner, who had been a terror to all the region until he came under the influence of Christianity. He opened mission stations, printed the Bible and other books in the native language, and made the whole region a center of Christian light. From 1838 to 1843, he was in England, publishing his *Missionary Labors in South Africa*, and telling to crowds of hearers his adventures and work in that land. He returned with other missionaries, remaining until 1874, when after 54 years of missionary work he once more made England his home, where his labors were honored by a gift of $25,000 and a public reception in London. He died Aug. 8, 1883. His influence led Livingstone, whose wife was Mary, the daughter of Robert Moffat, to Africa.

Mogul (*mō-gul'*). See INDIA.

Mohacs (*mō'hȧch*), a town of southern Hungary. It is a station for steamboats on the Danube and has considerable trade in wine, coal, and timber, mostly with Vienna. It is noted as the scene of a great battle, fought Aug. 29, 1526, between 200,000 Turks under Soliman the Magnificent, and 25,000 Hungarians under their king, Louis II. The Hungarians were defeated, losing their king, seven bishops, a large number of nobles, and 22,000 men. A second battle was fought here in August, 1687, when the Turks were defeated by the Hungarians, losing 20,000 men. Population 15,000.

Mohammed (*mo-hăm'ed*), or **Mahomet** the founder of the Mohammedan religion, was born at Mecca, Arabia, about 570 A. D. His early life was spent in poverty, partly as a shepherd, until acting in some capacity, perhaps as a camel-driver, in the caravan of a rich widow, Khadija. She, though fifteen years older, became his wife. He spent his time after this, while a merchant, largely in lonely meditation. Christianity and Judaism both prevailed in the region, and the ancient pagan religion had lost its hold on the people. Missionaries from Arab tribes began preaching at Mecca and Medina, and were the forerunners of Mohammed. His first religious revelation, as he called it, received from the angel Gabriel, when he was forty years old,

was a command to preach a new religion. These revelations were always attended by spasms, something like fits of epilepsy, which were believed by his enemies to be the work of devils. The revelations continued at intervals and were collected and written down after his death, forming the Koran or sacred writings of this religion. His first revelation, when told to his near friends, brought him only ridicule, but at the end of four years he had forty followers. The command was then given him to come forward publicly as a preacher, which he did, exhorting to a moral life, and a belief in one God, whose prophet he was. At first he was looked upon as a harmless maniac, but as the number of his followers increased, and his attacks on the old religion became more severe, the people of Mecca rose against him. His uncle, though not believing in him, protected him, carrying him to a strong castle, where he stayed three years. His whole clan was outlawed and his followers suffered persecution, a hundred of them fleeing to Abyssinia. After his return to Mecca he lost his wife and his uncle, and was reduced to poverty. He made several new converts, from Medina, increasing their number with each pilgrimage that was made to Mecca, until, when they numbered seventy, he decided to flee from Mecca to the friendly city of Medina, which he reached in 622 A. D. This flight, or Hegira, is the beginning of the Mohammedan era. His position was at once changed, and from being a despised maniac, he became the ruler of the city and the head of two powerful Arab tribes. His most important act at this time was the giving permission to carry on war against the enemies of the new faith. Victorious in the first battle against the Meccans, adventurers flocked to his standard, and he carried on the war with the Arab tribes successfully, yet with great cruelty. He finally made a ten years' peace with the Meccans, which allowed him to send his missionaries through Arabia, and he soon made his first pilgrimage to Mecca with 2,000 followers. From this time his power increased rapidly. He marched to Mecca with an army of 10,000 men, and was proclaimed chief. Tribe after tribe sent messengers to do homage to him, either as the Prophet of God or the prince of Arabia.

His last pilgrimage to Mecca was made in the tenth year of the Hegira, and at that time he ordered the ceremonies of the great pilgrimages, which are still observed. His last sickness occurred in the house of his favorite wife Ayesha, who was but one of many whom he married after the death of Khadija. He called for writing materials, probably to indicate his successor, but Omar, his most influential friend, prevented their being given him, fearing he would appoint Ali, while he himself wanted Abu Bekr. Mohammed died at Medina, Arabia, June 8, 632, in the eleventh year of the Hegira. Abu Bekr said to the gathered crowd, who would not believe in his death: "Whoever among you has served Mohammed, let him know that Mohammed is dead; but he who has served the God of Mohammed let him continue in his service, for he is still alive and never dies." The tomb of Mohammed, in the house where he died, is now part of the mosque at Medina.

The religion of Mohammed recognized the one God, the creator of all things; Adam, Noah, Abraham, Moses, Jesus, and Mohammed as successive prophets, who proclaimed new laws, which did away with all that had gone before; it recognized also the resurrection from the dead and a final judgment and future rewards or punishments. It commanded prayer, almsgiving, fasting, and pilgrimages. It forbade the drinking of wine, all games of chance, the use of blood of swine or animals dying from disease as food, and the worship of idols. It allows polygamy, though limiting the number of wives to four. Every Mohammedan prays five times a day, and the hour for prayer, called by the muezzin, is announced by this officer, from the minarets of the mosques. When praying their faces are turned toward Mecca. The Koran, the sacred book of the Mohammedans, is made up of the "revelations" made to Mohammed, which he had written down, but which were not collected until after his death. It comprises some 114 chapters, and the contents are drawn from the ancient Arab traditions, the Old and New Testaments, the Talmud of the Jews, and later writings. Eighty years after the death of Mohammed, Islam, as the Mohammedans call their religion, ruled in Arabia, Syria, Persia, Egypt, a part of Africa and Spain. Two hundred millions of the human race embrace it to-day. Its conquests in modern times have been in Africa, but its power has declined in other countries. See *Mahomet*, by Washington Irving; *Life of Mahomet*, and *Mahomet and Islam*, by Sir W. Muir.

Mohammed Ali or **Mehemet** (*mā'he-met a'lē*), viceroy of Egypt, was born at Kavala, Macedonia, in 1769. He served in the Turkish army in the war against the French in Egypt, and became one of the most popular of military leaders. After the French were driven out, he fought with the Turks against the Mamelukes, and finally was made pasha, or chief ruler, by the people of Cairo, and confirmed in his power by the sultan of Turkey. After many contests with the Mamelukes, aided during part of the time by the British, he enticed, in 1811, a large number into the city of Cairo and treacherously murdered 470 of his guests, following it by a general massacre of the Mamelukes throughout the country. In 1816, he conquered part of Arabia, and, in 1820, Nubia and a part of the Sudan. His armies, under his son Ibrahim, invaded Syria, which Turkey ceded to Egypt on condition of tribute. His conquests were checked

when within six days' march of Constantinople, by the allied forces of the European powers. In 1840, he was compelled by Great Britain, Russia, Austria, and Prussia to accept terms of peace, by which Egypt was secured to him and his descendants, on condition of yielding Syria to the sultan and paying him a quarter of his revenues as tribute. He introduced many modern improvements into Egypt, maintained a standing army, and increased irrigation, the cultivation of cotton, and manufactures. He died at Cairo, Aug. 2, 1849.

Mo'hawks, a tribe of American Indians, one of the Five Nations or Iroquois. They were friends of the Dutch in New York, and afterward of the English, and during the French and English wars they did good service in Canada. In the Revolutionary war, under Brant, they fought with the English and massacred American settlers. Since 1784, they have been settled in Upper Canada (Ontario). Brant translated the prayer book and a part of the Bible into the Mohawk language, and there is also a dictionary and a grammar of the language. See *History of the Five Indian Nations*, by Colden; *Brant and Red Jacket*, by Eggleston and Seelye.

Mohicans (*mō-hē'kanz*), or **Mohegans** (*mō-hē'ganz*), a tribe of Indians belonging to the Algonquin family, who were living on the Hudson river when that region was settled by the Dutch. They fled to Connecticut, being driven there by the Mohawks. They joined the English against the French, but during the Revolution sided with the Americans. They have since been scattered, some settling at Oneida, N. Y., some moving to Wisconsin, and a small remnant going to Kansas. They have mostly given up their language, and have become citizens. The name has been made famous by Cooper's novel, *The Last of the Mohicans*. See *Indian Mission at Stockbridge*, by Jones; *Indian History for Young Folks*, by Drake.

Moldau (*mol'dow*), the principal river in Bohemia, rises 3,870 feet above the sea, in the southwestern part of the country, and flows first southeast and then north, until, after a course of 278 miles, it joins the Elbe about 20 miles north of Prague.

Molda'via. See RUMANIA.

Mole, a burrowing animal with a barrel-shaped body and sharp snout. The front paws are broad and stout and well fitted for digging. Moles are covered with a dense velvety fur of a dark color. As they lead an underground life, their eyes are minute or rudimentary, and often covered with skin. They are found in both the Old and the New Worlds in the northern hemisphere. The common English mole disfigures lawns, pastures, and gardens extensively, by the ridges and furrows it makes hunting after food, but as it feeds on injurious larvæ and insects, it compensates for the damage. The fortress of the mole is complicated. In little hillocks of earth, called mole-hills, there is constructed a central chamber, surrounded by two ring-like galleries, one above the other. These circular galleries are connected by vertical passages, and the upper one has five openings into the central cavity. From the lower gallery, about nine alleys lead off in different directions toward the feeding-grounds. They feed mainly on earthworms and also eat insects, larvæ, field mice, etc. Occasionally, on fine summer nights they issue from their burrows. The star-nosed mole is peculiar to the northern United States, and to British America. It has arranged around its snout twenty cartilaginous rays which contain organs of touch.

Mole-Cricket. See CRICKET.

Molecule (*mŏl'e-kūl*) is a word which is employed in science with two rather different meanings. Experiment has shown that matter is not continuous, but is probably made up of very small particles. Accordingly, the chemist uses the word *molecule* with considerable accuracy to mean the smallest portion of any kind of matter which can exist alone and yet preserve the properties of this particular kind of matter. Thus the smallest portion of table salt which can exhibit the properties of table salt must contain still smaller parts of sodium and of chlorine. These smaller particles of which the molecule is made up are called *atoms*. But even when a body is made up of atoms of one kind, these atoms rarely remain uncombined, but unite with each other to form molecules. Thus hydrogen gas is composed of molecules made up of two atoms of hydrogen. Remsen distinguishes between molecules and atoms as follows: "Atoms are the indivisible constituents of molecules. They are the smallest particles of the elements that take part in the chemical reactions, and are, for the greater part, incapable of existence in the free state, being generally found in combination with other atoms, either of the same kind or of different kinds." (*Chemistry*, p. 74). In chemistry, the molecule of a compound consists of atoms of a different kind, while the molecule of an element consists of atoms of the same kind.

In physics, the word *molecule* is used more loosely, often, to mean the smallest particle of a substance with which we are dealing, whether it be made up of one or more atoms, and whether these atoms be of the same or of different kinds. Thus there is reason for thinking that the diameter of a hydrogen molecule is something like 5.8×10^{-8} centimeters, while the diameter of a carbon dioxide molecule is larger, namely, 9.3×10^{-8} centimeters. Molecule is used in this sense in the classical illustration given by Lord Kelvin, that a drop of water magnified so as to appear the size of the earth would be made up of molecules about the size of cricket balls.

Too little is yet known about molecules even to define exactly what is meant by "the size of a molecule." See ATOM. HENRY CREW.

Mollere (*mo-le-êr'*), **Jean Baptiste Poquelin,** a French dramatist, was born at Paris, Jan. 15, 1622. His father's name was Poquelin, the name Molière being taken for the stage. He began as a theatre manager, failing in Paris, but successful in the provinces, returning to Paris in 1658, where he organized a regular theatre. He wrote several of his comedies while traveling through the country with his theatrical troupe. He depended largely for his tragedies, as a theatre manager, on Corneille and Racine, and in his comedies and farces borrowed from Spanish and Italian literature, owing to the haste with which many of them were written for use in his theatre. From the year 1659, when the first of his great comedies appeared, until 1673, not a year passed without adding one at least to the number of these immortal works. He attacked with his satire, religious hypocrisy, in *Tartuffe*, which, in consequence, was forbidden the stage for five years; the vanity and follies of women; the frivolity of the nobles, and the pretensions of the learned classes, especially the doctors. His wit, his satire, and his power over language, place him in the highest rank of French writers; and his plays have held their place on the stage for two hundred years. His greatest works are: *The School for Wives*, *The Misanthrope*, *Tartuffe*, *The School for Husbands* (*L' École des Maris*), *The Physician in Spite of Himself* (*Le Medecin Malgré Lui*), *The Imaginary Invalid* (*Le Malade Imaginaire*), and *Learned Women*. He died at Paris, Feb. 17, 1673. A century after his death his bust was admitted to the French academy, which had never received him as a member because he would not give up his profession.

Moline (*mō-lēn'*), a city of Illinois, in Rock Island county, on the Mississippi river, 179 miles west of Chicago. It is separated from Rock Island by a narrow channel, which is used as a water-power. It is a manufacturing city, with numerous mills and factories. Population 17,248.

Mol'lusks, a sub-kingdom of animals, with a soft body, as snails, clams, and others. The body is not jointed as in the earthworm and crayfish. Mollusks usually possess a shell, but there are some naked forms. They live on land, and in both fresh and salt water. Some mollusks have a larval form, similar to that of some worms, and this serves to connect the two groups. The group is a large one, and is divided into classes as follows: *Gasteropoda*, those like snails, crawling on a broad fleshy foot. The class contains common snails, slugs, and many sea shells, like whelks, etc. (See SNAIL, and LIMPET.) Land snails, feeding on plants in damp districts, are common in many sections of the United States and other countries. In the Philippines are many tree snails. Pond snails are abundant in still water; there are flattened forms, long sharp-pointed ones, and others showing gradations between the two. *Lamellibranchiata*, mollusks with gills like plates or lamellæ, represented by clams, oysters, and mussels (which see). Their shells have two valves, and they are, therefore, called bivalves. *Cephalopoda*, mollusks with processes called arms or feet clustered around the head, and, therefore, named the head-footed. The arms are provided with sucking disks. (See CUTTLEFISH, SQUID, NAUTILUS, etc.) *Amphineura*, containing the Chitons, and *Scaphopoda*, represented by the elephant tooth shell, are two classes of less popular interest. The mollusks are represented by twenty thousand living and nineteen thousand fossil species. See Woodward's *Manual of the Mollusca* (3d ed., 1875).

Molly Maguires (*mol'-i-ma-gwirs'*), an Irish secret society which existed from 1867 to 1877 in the coal regions of Pennsylvania. The name came from Ireland, where a band of "ribbon men" carried on their outrages by night, disguised as women. The society in Pennsylvania attempted to obtain political power by a system of terror, committing murders when opposed. A number of the leaders were convicted and executed, by the aid of a detective who acted for three years as the secretary of one of the branches of the society.

Moloch (*mō'lok*) or **Mo'lech,** the name of a heathen god worshiped in Judæa. He was once called the god of the Ammonites, and his worship was probably derived by the Jews from some of the neighboring tribes. The kings Ahaz and Manasseh are spoken of as making their children pass through the fire of Moloch. The victims were slain and afterward burned on a funeral pile called "Tophet," in the valley of Hinnom, near Jerusalem. The story of an image of brass, heated red-hot in which the children were burned, is an invention.

Moltke (*mōlt'ke*), **Helmuth von** Count, a distinguished German field-marshal, was born Oct. 26, 1800, at Mecklenburg-Schwerin. His father being a Danish officer, he was sent to a military school at Copenhagen, and entered the Danish army as a lieutenant, but left it for the Prussian service. He spent considerable time in the study of military tactics and foreign languages, and was appointed on the staff of Prince Frederick William. Traveling in Turkey on a leave of absence, the

COUNT VON MOLTKE.

sultan retained him as military adviser, and gave him the work of remodeling the Turkish army. He was chief of the general staff of the army in Berlin from 1858 to 1888, and reorganized the Prussian army. He also made plans for coast defenses, and the creation of a navy. His great powers as a military leader were shown in the war with Denmark in 1863, with Austria in 1866, and with France in 1870. He was called "The Silent," from his great modesty and reserve. He wrote *Letters from Turkey*, *The Campaign in Turkey*, *The Italian Campaign of 1859*, and *Letters from Russia*, while the *History of the German and French War*, by the general staff, was written under his direction and much of it by him. His ninetieth birthday was celebrated with much honor by the emperor and the German people. He died at Berlin, April 24, 1891. See *Life* by Müller, translated by Pinkerton.

Moluccas (*mō-luk'ăz*), called also **Spice Islands**, a division of the Malay archipelago or Dutch East Indies. It includes most of the islands between Celebes and New Guinea, east and west, and between Timor and the Philippines, north and south. It is divided into the Northern Moluccas and the Southern Moluccas. The northern group runs from north to south, is surrounded by deep water, includes ten or a dozen large islands with smaller ones, and has a population of about 60,000. The largest island is Jilolo, while the smaller islands of Tidor and Ternate have been the most important. They were occupied by civilized tribes of Malays, who ruled the ruder tribes on the surrounding islands, and were later the seats of the powerful Mohammedan sultans; and now, as the seat of the Dutch government or residency, Ternate has most of the trade of the Northern Moluccas, exporting spices, tortoise shell, beeswax, and birds of paradise. The Southern Moluccas are separated from the northern group by a very deep ocean chasm, and are connected by a shallow ocean bed. There are two large islands, three or four smaller ones, and several clusters of small ones, covering about 43,864 square miles, and having a population of 400,000. The town of Amboyna, the capital of the Dutch possessions in the Moluccas, carries on a large trade in cloves, 500,000 pounds being raised in some seasons in the clove gardens of the government. Banda, the third Dutch residency, is the home of the nutmeg, which grows on the slopes of the volcanic islands. Besides nutmeg and mace, it also exports sago and cocoanuts. The region of the Moluccas is volcanic, and there are still several active volcanoes, from one of which, Api, in Banda, there was a terrible eruption in 1825. The climate is tempered by the ocean breezes, and by the height of the islands, some of them rising 8,000 or 10,000 feet above the sea. Spices grow abundantly, but were rooted out by the Dutch government from all the islands except the Banda group and Amboyna, to give the latter a monopoly of the trade. The animals are curious, such as the flying opossum, the bird of paradise, the mound-building bird, the long-armed beetle, most gorgeous butterflies, and beautiful sea anemones, shells, and corals.

Mommsen (*mom'sen*), **Theodor**, a German historian, was born at Garding, Schleswig, Nov. 30, 1817. He spent three years traveling in France and Italy, studying Roman inscriptions, edited a newspaper in Schleswig, and held a professor's chair at Leipsic, that of Roman law at Zurich, and the same professorship at Breslau, and that of ancient history at Berlin. His large library was burned in 1880, and a new one was presented him by his English students. He edited, with others, several historical works, and wrote a number on Roman law, Roman coins and kindred subjects, making him famous as one of the greatest scholars of the age. His great work, a *Roman History*, in three volumes, has passed through five editions, and been translated into French and English. From 1873 to 1882, he was a member of the Prussian chamber of deputies, when he acted with the national Liberal party.

Monaco (*mon'ă-kō*), a small principality on the Mediterranean, nine miles from Nice. It covers eight square miles, and consists of a rocky promontory, on which the city of Monaco is built, and a small strip of coast. Here, within the petty state, is the great gambling town and casino of Monte Carlo. It has belonged to the Grimaldi family for over 900 years. They have several times put their country under French protection, and in 1859 the whole region belonged for a short time to Victor Emmanuel. The owner at another time sold a part of his dominions, including Mentone, to Napoleon III. for $200,000. His capital is now under French protection. The climate is mild, and palms, aloes, and other southern plants are abundant. Population of the entire principality 13,304.

Monastir (*mŏn-as-tēr'*), also called **Bitolia**, the second city in Turkish Macedonia, is situated in a broad mountain valley, ninety miles northwest of Salonica. It manufactures carpets and silver filigree, and trades in corn and other farm products. The Turks have made it the head of an army corps, as it is an important military point. Its ancient Greek name was Pelagonia. The Albanian beys were massacred here in 1833. Population 45,000. Monastir is also a vilayet, or province, in European Turkey, area 10,690 square miles; population 847,400.

Mon'ey is the name given to those substances which are used to facilitate commercial exchanges and to serve as a measure of values. Nearly all metals have been so used at some time, or by some nation, but

[illegible] have been found the most [illegible] for general purposes. [illegible] and even [illegible] have been accepted [illegible] civilized nations, [illegible] have frequently [illegible] The value of [illegible] like other values, [illegible] the supply [illegible] at the time [illegible] and the [illegible] amount of commercial [illegible] which money is [illegible] the problem so many other [illegible] that no simple theory can be [illegible] account for all the [illegible] The use of money raises com- [illegible] barter to a [illegible] If the world had [illegible] the seller could only sell [illegible] with a desire also [illegible] which the first [illegible] But by [illegible] can be sold or any- [illegible] at any time, by persons [illegible] to facilitate the trans- [illegible] The supply of gold being limited, [illegible] has always been held [illegible] than other [illegible] depending upon the [illegible] and the size of the trans- [illegible] In deals involving [illegible] it would seem necessary [illegible] some form of money in which the [illegible] might be easily transferred. In [illegible] money was issued by private in- [illegible] in order to insure inspection [illegible] this duty and [illegible] has now been assumed by the state. [illegible] a charge is made by the [illegible] for transforming bullion into [illegible] the metal is converted [illegible] at little expense to the owner, [illegible] ground that the cost is small [illegible] according to the state, [illegible] the increase of the stock of [illegible] The history of coinage in the [illegible] is of surpassing interest, and [illegible] attention to the student. It is [illegible] to give them due attention in so [illegible] work as this; but it may be noted [illegible] the relative value of gold and bullion has in- [illegible] from $15.93 in 1873, to [illegible] and that of silver from $1.15 [illegible] $1.34 in 1900. The money of all [illegible] circulation in the United States has [illegible] from $18.10 per capita in 1860, to [illegible] The per capita circulation of [illegible] the world is estimated at $5.00 and [illegible] at $3.00. The coinage of gold and [illegible] the world averages at present, about [illegible] annually, according to the reports [illegible] and by the national government.

[illegible] a city near Appomattox, situated [illegible] and south of China proper, [illegible] of Manchuria and east of eastern Turkestan. It is in the main a wide waste, comprising the great desert of Gobi. Its area is 1,288,000 square miles, with an estimate population of 2,000,000.

Mongols (*mong'gols*), an Asiatic race, constituting one of the large divisions of mankind, including the Mongols proper, known as East Mongols and West Mongols and Bariats, and the Tartars, who form a distinct branch. The Kalmucks belong to the West Mongols. Mongolia, inhabited by the East Mongols, is a part of the Chinese empire lying south of Siberia, and shut in by mountain ranges. The people lead a wandering life, dwelling in tents, and having flocks of sheep and herds of horses, cattle, camels, and goats. They are mostly Buddhists in religion, and fond of making long pilgrimages. There are about 2,000,000 of them under Chinese rule. The Western Mongols have mingled with their Turkish neighbors so that it is difficult to number them. They are found in Russia, Astrakhan, Turkestan, Bokhara, Samarcand, and the Crimea. The history of the Mongols begins with Genghis Khan, born about 1160, who united the different tribes into one nation and led them out to conquest. They overran Tartary, a large part of China, Persia, Russia, and Afghanistan. Under his sons and their successors, other portions of China were conquered, the caliphs of Bagdad overthrown, and Europe invaded as far as the Danube, making the Mongol empire, at its height, the greatest the world has known. Kubla Khan, the grandson of Genghis Khan, established the first Mongol dynasty in China, which was finally overthrown by the Chinese in the 14th century. The Mongol kingdom, divided in the 13th century, was united again in the 14th century under Tamerlane, but after his death lost its power, until in the 17th century it became a part of the Chinese empire. The Mongolian language belongs to what is called the Turanian family. There is very little extant literature, what they possess being mostly translations from Chinese religious works; the original works being mainly accounts of the deeds of Genghis Khan and Tamerlane. See *History of the Mongols*, by Howorth; *Among the Mongols*, by Gilmour.

Monitor, the name given to a kind of warship first used in the Civil war. It was a wooden ship covered with plates of iron, carrying in the center a revolving tower or turret, in which the guns were placed. The first one used was made by Captain Ericsson in 100 days, and was engaged in the naval battle with the confederate ship *Virginia*. The success of the *Monitor* produced great excitement in Europe and made a revolution in the construction of naval vessels. England immediately experimented with this style of warship, changing a wooden vessel into an ironclad monitor, which was considered the most formidable ship in the navy. Improvements were made from time to time, until the

greater part of naval vessels are now made upon this principle and known as monitors or "ironclads." See NAVY.

Monk (*mungk*), **George,** Duke of Albemarle, an English general, was born in Devonshire, England, Dec. 6, 1608. His first services in the army, at Cadiz, Rochelle, consisted of nine years in Holland, and in wars against the Scotch and the Irish, ended in 1644, when he was taken prisoner by Fairfax and kept in the Tower of London for two years. He was freed by agreeing to the covenant. He was major-general at Ulster, and Cromwell left him to finish the conquest of Scotland, and in 1654 he was appointed governor of the country, a position he filled well for five years. At the death of Cromwell, while everything was in confusion, he marched to London with 6,000 men, and entered the city without opposition in February, 1660. Every party wanted him, and felt that the fate of the country lay with "Old George." His own wish was to bring back the Stuarts, and he found the nation with him. He worked slowly and with circumspection; freed the parliament from the power of the army, admitted members that had been excluded, and brought about the election of a new parliament, and on May 23, 1660, he welcomed Charles II. at Dover. He was rewarded with high offices, and made duke of Albemarle, but soon retired from political life. As governor of London, at the time of the plague, he stayed at his post and helped bravely. He died Jan. 3, 1670. "A man capable of great things, but possessing no greatness of soul," is the judgment of Guizot. See *Life*, by Guizot, and also the one by Corbett.

Monkey (*mŭn'kĭ*), a word loosely applied to apes, baboons, Old and New World monkeys, marmosets, and lemurs. Here it is, for convenience, restricted to the smaller forms living on trees, and usually having long tails. This separates them from the baboons and higher apes on the one hand, and the lower lemurs on the other, all of which are noticed alphabetically. The New World monkeys have nostrils wide apart (*Platyrrhini*), and most of them have long tails used for grasping. They inhabit the forests traversed by the Amazon and the Orinoco, and extend north to Panama. Ten species live north of this in Central America, and one—the spider monkey—extends its range into Mexico. The howling monkeys have a resonance chamber at the top of the windpipe, and, night and morning, they make the forests resound with their hideous howling. They cannot be tamed. The monkeys usually seen in captivity, from South America, are marmosets and monkeys of the genus *Cebus*. The marmosets are the smallest monkeys, not much larger than squirrels, and are usually made a separate group. The spider monkeys have slender bodies, long, angular limbs, and very long tails, which are used as a fifth hand. The Old World monkeys are entirely distinct. Their nostrils are close together (*Catarrhini*) and the tail, when present, is not used for grasping. The macques, inhabiting India, Thibet, Malay archipelago, Philippines, etc., are often seen in menageries. Throughout Africa are found numerous troops of monkeys with slender bodies, like the green monkey. They live on trees and have long tails. The Catarrhini include also baboons and higher apes, but these are treated separately. See APE, BABOON, LEMUR, and MARMOSET.

Mon'mouth, Battle of, an engagement between the English forces under Clinton, and the American forces under Washington, at Freehold, Monmouth county, N. J. It was Washington's first battle after the dreary winter at Valley Forge. General Lee was in charge of the advance, which was thrown into confusion and began a retreat. Washington hurried to the front, reproving Lee sharply, and rallied the fugitives. Tradition says that this was the only time that Washington was known to swear. The Americans held their ground, and Clinton retreated in the night. Lee was deprived of his command for a year by court-martial.

Mon'mouth, James, Duke of, was born at Rotterdam, Holland, April 9, 1649. He was thought to be a son of Charles II., and as such was made duke of Monmouth, and wedded to a rich heiress. In spite of his profligacy, he became the idol of the people, thanks to his beauty and winning manners, his royal tours through the country, and his humanity toward the Covenanters at Bothwell Bridge, in 1679. His share in what is known as the Rye House Plot, in 1683, was discovered, and he fled to Holland. After the death of Charles, he returned to England, with eighty-two followers, landing June 11, 1685. He claimed the throne, attacked the king as a murderer and Catholic, and had himself proclaimed as James II. Gathering a force of about 3,000 men, mostly peasants and miners, he risked a battle with the king's troops at Sedgemoor. He was defeated, losing nearly half his army, and was captured when fleeing, disguised as a shepherd. His tears and pleadings, and even the promise to change his religion, were of no avail with the king, and he was beheaded at London, July 15, 1685. See *Life*, by Roberts.

Monocotyledons (*mŏn'o-kŏt'i-lē'dŭns*), plants forming one of the two great groups of angiosperms, containing about 25,000 recognized species. The name comes from the fact that the embryo develops a single cotyledon. The other features which distinguish the group in general are the structure of the stem, in which the woody bundles are scattered, as in the common corn; the parallel-veined leaves, and the members of the flowers in threes. Monocotyledons were once

called "endogens," an antiquated name which has been entirely abandoned. Prominent monocotyledonous groups are as follows: "Pond-weeds," among which are the numerous more or less submerged aquatics and closely-allied forms, and related to which are the well-known forms of arrowleaf and cattail flag; "grasses," one of the largest and most useful groups of plants, much confused with the nearly allied sedges; "palms," a group of tree monocotyledons very characteristic of the tropics; "aroids," an immense tropical group represented in temperate regions by skunk cabbage and Jack-in-the-Pulpit, and in cultivation by the better known calla lily; "lilies," associated with which are the numerous amaryllis and iris forms; "orchids," which in number of species are most numerous among the monocotyledons, and favorites in greenhouse cultivation on account of their brilliant color and bizarre forms.

Monongahela (*mō-non'ga-hē'la*), a river, one of the sources of the Ohio, rises in West Virginia, flowing north into Pennsylvania where it unites with the Allegheny at Pittsburg and forms the Ohio. It is 250 miles long, and is navigable for about 80 miles for large boats. The Cheat river and the Youghiogheny are its chief branches. Here, on the banks of the river, near Pittsburg, was fought, July 9, 1755, a battle between the French and the Indians and the British and colonial troops under Braddock. The latter were beaten.

Monop'oly, a term used to indicate the sole right to sell or trade in any article, given to a single person, or to a group of persons. In early times this right was often granted by government, as in the time of Queen Elizabeth, salt and coal were articles whose sale was thus limited; and one of the greatest monopolies the world has ever known, the East India company, received its charter at that time. These government monopolies were opposed by the English people, and finally put an end to. Monopolies, under their modern form of trusts, combines, syndicates, or unions, are the same in principle, an effort to do away with competition and give to one set or class of persons the sole right of selling or trading in an article. These combinations are effected by the use of capital, which is employed to drive out of business all small dealers. The Standard Oil company and the Reading Coal "combine" are well-known instances of great American monopolies.

Monroe', James, the fifth President of the United States, was born in Westmoreland county, Va., April 28, 1758. He entered William and Mary college, but soon left to join the army under Washington. He was in several battles, was wounded at Trenton, and became lieutenant-colonel and military commissioner. In 1782, after studying law with Jefferson, he became a member of the Virginia assembly and was sent the next year to congress. Here his services were influential in bringing about the conventions at Annapolis and Philadelphia, where the constitution of the United States was framed, which, however, he opposed in the Virginia convention, siding with Patrick Henry and other States' Rights men. He was in the United States senate from 1790 to 1794, and became minister to France from 1794 to 1796, when he was recalled because of his too open expressions of sympathy with the revolution. His former opposition to Washington and this treatment induced him to publish an attack on the government, which made him the favorite of the Democratic party. He was governor of Virginia for three years, and then was sent by Jefferson to France, where, with Robert Morris, he effected the Louisiana purchase in 1803. His efforts for a cession of Florida by Spain were unsuccessful, and the treaty with England obtained by him failed to provide against the seizing of American sailors. In 1811, he was again governor of Virginia, and secretary of state under Madison until 1817. In 1816, he was elected President of the United States, and re-elected in 1820. The most popular measures of his administration were the obtaining of Florida from Spain (1819), the settling of the slavery question by the Missiouri Compromise, the recognition of the independence of the Spanish American republics, and the announcement of what is known as the Monroe Doctrine. In a message to congress approving the bill which recognized the South American republics, Monroe declared that "the American continents are not to be considered as subjects for colonization by any European power." This declaration, known as the "Monroe Doctrine," has ever since held a place as well in the diplomacy as in the political creed of the nation. After his retirement to his home in Virginia, he became involved in debt, but found a home with his son-in-law in New York, where he died, July 4, 1831. See *Life*, by Gilman, in the "American Statesmen" series.

JAMES MONROE.

Monsoon, a term meaning a "set time or season," formerly used to indicate the winds prevailing in the Indian ocean, blowing from the southwest from April to October, and from the northeast from October to April. The word is used now of all winds that are regular, returning with the seasons. The prevailing winds of North America are largely of this class, and there are monsoons in Aus-

tralia, on the coasts of Brazil, Peru, and North Africa. See WINDS.

Montagu (*mon'ta-gū*), Lady **Mary Wortley**, was born about 1689 in Nottinghamshire, England. When only eight years old her father introduced her to the famous Kit-Cat club, of which she became a member. After her marriage her husband's public position brought her into court society in London, where she was celebrated for her wit and beauty, and numbered among her friends Addison, Pope, and other literary men of the time. In 1716, her husband was English ambassador at Constantinople, and during her life there of two years, she wrote the *Letters* that have have made her famous, addressing them to her sister, to Pope, and other friends. They are descriptions of eastern life and manners. She became convinced of the benefit of inoculation for smallpox while abroad, and introduced it into England, trying it first on her own son. She died Aug. 21, 1762. See *Life*, in the edition of her works by Wharnecliffe.

Montaigne (*mon-tān'*), **Michel Eyquem de**, a famous French essayist, was born in 1533, in Perigord, France. His father had peculiar ideas of education, and put them in practice in his son's case. He was nursed by a poor woman in a village, that he might learn simple habits of living and sympathy with the poor. That his boyhood might be made as happy as possible, he had him wakened every morning by the sound of music. As he must learn Latin, then the necessary foundation of all education, he had him taught it in the easiest way, by conversation, and until he was six years old he understood no other language. His father sent him to school at six, making various arrangements to carry out his plans of education. He studied law, and became a city counselor, holding the office for thirteen years. His first literary work was a translation of a Spanish *Natural History*. On the death of his brothers, he succeeded to the family estate, and here began his famous *Essays*, which were written simply because he felt the need of occupation. These essays, written apparently without any plan, inspired by the caprice of the moment, touching upon his daily life, his habits, tastes, and thoughts, on all kinds of subjects, have held the attention of a large class of readers, of all kinds and sorts, for 300 years. The circle of admirers widens every year, and is almost equal to that composed of the followers of Shakespeare. He died in 1592. See *Representative Men*, by Emerson; *Montaigne*, by Collins.

Montana (*mŏn-tă'na*), one of the northwestern states of the Union, is the third in size, coming next to Texas and California, covering a land surface of 145,310 square miles, being larger than the British islands. The Rocky mountain region in the western part includes one-fifth of the state, while the eastern part is in dry, rolling plains, needing irrigation to make it productive. The mountainous part rises from 8,000 to 11,000 feet high, with high valleys and passes, but the eastern plains are lower than Colorado or Wyoming, so that the climate is somewhat milder. The dry regions of the east have already been improved by canals and reservoirs, built by private enterprise. The Bad Lands, as they are called, near the Yellowstone river, have a peculiar soft, sticky soil, in which animals sink at every footstep. The Rocky mountains cross the state for 300 miles, with numerous smaller ranges and fertile valleys. The Missouri river has 1,300 miles in Montana, and the Clark's Fork of the Columbia river runs north into Idaho, their sources being scarcely a mile apart. Through a great cañon, cut for five miles through a gorge from 600 to 4,000 feet deep; past Bear Tooth's mountain, 2,500 feet high; by the Long Pool, with its strange, booming noises; over the Great Falls, where, in four separate descents in 15 miles, its waters fall 450 feet, and through five miles of rapids, the Missouri river makes its way 4,000 miles to the gulf of Mexico. The Yellowstone, rising in the National Park, crosses the entire state for 850 miles. There are many mountain lakes and numerous mineral springs. The Warm Springs are near the wigwam-shaped geyser, with its smoke ascending like a council-fire, in Deer Lodge valley. Near Helena, the hot springs have created a resort for invalids and tourists, with one of the largest bath-houses known, and a very fine hotel. The climate is variable, with sudden changes, and a scanty rainfall east of the mountains, while in the northwestern part of the state, the rainfall is more ample, and the climate made milder by the great, warm current from Japan. Stock-raising is one of the industries of the country, the flocks running wild, guarded by shepherds and dogs, and horses and cattle are kept in large herds on the great ranches. The greatest wealth of the state is mineral, and its foremost industry is mining. About one-third of the gold, silver, copper, and lead mined in the United States is from Montana. The first gold was discovered in 1852, but little was done in mining until 1860, the mines now producing enormous quantities, and bringing great wealth to their owners. Silver, lead, and copper are also mined, these, with gold, producing in one year nearly $70,000,000. Large beds of coal and deposits of iron-ore are also found. The College of Montana (Presbyterian) at Deer Lodge, the Montana Wesleyan university, at Helena, and Montana university, at Missoula, are some of the institutions of this new state. There are several United States' posts on the boundary line of Canada and at other places, to keep in check the Indians, and four Indian agencies with their reservations. Montana was admitted to the Union in 1889, and has a popu-

lation of 243,329, of which 12,500 are Indians. Its capital is Helena (population 10,770). The other chief towns of the state are Butte City (population 30,470), and Great Falls City (population 14,930). Montana was early visited by fur traders and French missionaries, but was not settled until after the gold discovery, in 1861. It has been the scene of many Indian wars, notably the terrible massacre of General Custer's forces by the Sioux. See *Washington, Idaho, and Montana*, by H. H. Bancroft.

Mont Blanc (*mŏnt blŏn*). See ALPS.

Montcalm (*mont-kăm'*), **Louis Joseph,** Marquis **de**, was born near Nimes, France, Feb. 29, 1712. He became commander of the French army in Canada in 1756, capturing very soon after the British fort at Oswego. Crossing Lake George, with 8,000 French and Indian troops, he took Fort William Henry, where the massacre by the Indians of the helpless women and children has left a blot on his memory. He defended Ticonderoga against a large British force under Abercrombie, and then moved to protect Quebec. In the attack by General Wolfe, the French were driven back into the city and in the retreat Montcalm was fatally wounded, dying the next morning, Sept. 14, 1759. When told of his danger he said, "So much the better; I shall not live to see the surrender of Quebec." See *Montcalm and Wolfe*, by Parkman.

Montclair', **N. J.**, a picturesque, progressive town in Essex county, five miles northwest of Newark, and fourteen miles from New York, many of whose merchants and business men have their homes here. It is on the Delaware, Lackawanna, and Western, and the New York and Greenwood Lake railroads. Montclair Heights, a charming suburb, has an elevation of 370 feet above tide water. It has a number of fine churches, schools, libraries, banks, and other adjuncts of a growing city. Population 13,962.

Monte Carlo (*mon'tā kar'lō*), a small town in Monaco, known as a great resort of gamblers. The gaming rooms are built on ground owned by the prince of Monaco, and are owned by a stock company. The number of visitors often reaches 400,000. See MONACO.

Montefiore (*mon-te-fē-ō'rā*), Sir **Moses,** a Jewish philanthropist, was born at Leghorn, Italy, Oct. 24, 1784, though London was the home of his parents. He inherited wealth and became a successful stock broker. He became prominent in all efforts to improve the condition of the Jews, making seven journeys to the east, visiting Poland, Russia, Rumania, Damascus, and Jerusalem, to investigate their condition and relieve their oppressions. His last journey was made when he was ninety-two years old. At Bucharest, he faced an anti-Jewish mob, at the risk of his life. He established colonies of Jews, and refuges for the poor in Palestine. His benevolence was not confined to his own race; he gave largely to all charitable institutions, and in 1835 was one of the parties to the contract to pay $75,000,000 to the owners of slaves in the British dominions, to compensate them for freeing their slaves. He was knighted in 1837, and in 1846 made a baron, in recognition of his services to the poor. He died at Ramsgate, in England, July 28, 1885, when 100 years old. See *Diaries of Sir Moses and Lady Montefiore.*

Montenegro (*mon-te-nā'grō*), a small, independent state in southern Europe, in the Balkan peninsula, covering 3,630 square miles, less than half the size of New Jersey. Its extreme length is a little over 100 miles, with a width of 80 miles. It has a low coast region on the Adriatic, and then a mountain region, 6,500 to 8,000 feet high, broken up into peaks and crags, and ravines and gorges, with rivers, running often for miles underground. The mountains are well wooded and give good pasturage. There is very little of the country that can be cultivated; the farms are small, and the fields are little patches clinging to the mountain sides. Corn, rye, oats, barley, potatoes, and fruits are the products. The people live in small stone houses in villages. They are Slavs, and belong mostly to the Greek church, and number about 228,000. They are sturdy mountaineers, whose business for many generations has been to fight the Turks. Montenegro formed part of the Servian empire in the 14th century, but secured its independence when Servia was conquered by the Turks. At one time they were governed by bishops, but in 1851, they separated the state from the church, elected a prince, and made the throne hereditary in his family. The country is progressing rapidly in the last few years. Good roads have been built, fields cultivated, and a standing army maintained. There is a rich literature of patriotic songs and ballads, and their former prince, Peter II. (1830–51), was one of the greatest poets that has written in the Servian language. The first Slavonic books were printed in Montenegro in the 15th century. The capital is Cettinjé (population 2,920). See *Montenegro*, by Denton; *A Winter in Albania*, by H. C. Brown.

Monterey', a city, the capital of the inland state of Nuevo Leon, in northern Mexico. It is a well-built town with tasteful houses, handsome churches, a cathedral, colleges, and government buildings. It is one of the most prosperous manufacturing towns of Mexico. It was founded in 1599. In the Mexican war it was besieged and taken by the American forces under General Taylor, Sept. 24, 1846. Population 45,695.

Montesquieu (*mŏn-tes-kū'*), **Charles de Secondat,** Baron **de**, a French writer of

eminence, was born near Bordeaux, France, Jan. 18, 1689. He was also called Charles Louis de la Brède. He was councilor of the parliament of Bordeaux, and afterward president. His studies were at first in the direction of the natural sciences, but his eyesight failing, he turned his attention to literary work. His first success followed the publication of the *Persian Letters*, pretending to have been written by two Persians who visited Paris, and are satires on French customs and society. He spent three years in travel, observing the institutions and habits of foreign countries. In England he remained two years, seeing its best society, and studying its philosophy in the writings of Locke and others. His ablest work, *Thoughts upon the Causes of the Greatness of the Romans, and of Their Decay*, appeared in 1734. Another great work, the product of twenty years of toil, was *The Spirit of Laws*, published at Geneva, in two volumes, in 1748. While this book came too late to save France from the revolution, it guided its best thinkers in the restoration of order and civil government. His eyesight failed entirely before his death, which took place in Paris, Feb. 10, 1755.

Montevideo (*mon-tē-vid'ē-ō*), the capital of Uruguay, is situated on the north shore of the La Plata inlet, about 125 miles south of Buenos Ayres. It is built on a low point between the ocean and a small bay, and has stretched out to the foot of a hill 505 feet high, crowned by an old fort and a lighthouse. It covers about five square miles, with broad, well-paved streets. A cathedral with towers and a fine dome, opera house, town hall, university (with 91 professors and 694 students), museum, etc., are among the public buildings. It has large beef-salting establishments, where 200,000 cattle are killed yearly; and other industries, mainly of articles for home use. It is the cleanest and healthiest city in South America, and has a large foreign population, brought mainly from Italy, Spain, and France. The first settlement dates back to 1726. Population 266,000.

Montezuma II. (*mon-tē-zū'mȧ*), the last of the Aztec emperors of Mexico, born in 1479 and ascended the throne in 1502. He gave his chief attention to the improvement of the laws of the country, and to building the magnificent palaces that are forever associated with his name. His enormous expenses led to heavy taxation, which resulted in many revolts among his people. When Cortez, the Spanish conqueror, landed in Mexico in 1519, Montezuma tried to buy him off with his treasures of gold and silver. Admitting him to his halls as a guest he soon found himself a prisoner in the Spanish camp. To quiet a revolt of the people Cortez led out Montezuma, who was wounded by a stone thrown by some one in the crowd. This, added to his other indignities, broke his heart, and tearing the bandages from his wound he refused all remedies and food, and died at Tenochtitlan, June 30, 1520. See CORTEZ. See *Conquest of Mexico*, by Prescott; *Story of Mexico*, by Hale.

Montfort (*mont'fort*), **Simon de,** earl of Leicester, an English general and statesman, the leader in the war of the barons against the king (Henry III.), was born in the beginning of the 13th century. His English title came to him through his grandmother and was confirmed to him by Henry III. in 1232. He married the king's sister, who had devoted herself to the church, but Montfort succeeded in obtaining the sanction of the pope. The king drove him, however, from his court, and he probably went on a crusade to the Holy Land. The king was surrounded with foreigners, who fared sumptuously at the expense of the people; bad harvests and famine added to their discontent, until in 1258 the barons appeared in arms before parliament and demanded the driving out of the foreigners and the appointment of a committee of twenty-four to manage affairs. Later in the same year, parliament, sitting at Oxford, drew up a set of laws, called the provisions of Oxford, which the king agreed to. By these provisions the foreigners were to surrender their castles, and Montfort gave up Kenilworth and Odiham. In 1261, the king repealed this act, which brought Montfort to the front as leader of the barons in their contest with the king. He surprised the king's army at Lewes and captured the young prince May 14, 1264. In his arrangements for a peaceable settlement of the difficulties a parliament was called, in which the barons, bishops, and abbots sat, with four knights chosen from each shire, and for the first time in England two representatives from certain towns. This may be looked upon as the germ of the modern parliament. He was, however, ahead of his times; the barons were dissatisfied and Gloucester deserted; the young prince escaped, and joining with Gloucester defeated Montfort, Aug. 4, 1265. He was killed on the field of battle (Evesham), but his memory survives among the people who know him as St. Simon. *The Song of Lewes*, first printed in a collection of political songs in 1839, is a full account of this constitutional struggle of the barons. See *Constitutional History of England*, by Stubbs; and *Life*, by Prothero.

Montgomery (*mŏnt-gŭm'er-ĭ*), the capital of Montgomery county, Ala., is situate on the Alabama river. It is surrounded with fine country seats and is a growing city, with artesian water, electric lights, and other modern improvements. Since 1865 the manufactories have increased rapidly, including foundries, steam mills, cotton gins, and oil works. The state capitol is a fine building, overlooking a wide stretch of country. The city is 400 miles from Mobile, on the Alabama river, a distance that formerly was

passed over by flatboats in a three months' journey. Population 30,346.

Montgomery, Richard, an American general in the Revolutionary war, was born in Ireland, Dec. 2, 1736. While an officer in the British army he took part in the siege at Louisburg, and in the attacks on Martinique and Havana. In 1775, he was made a brigadier-general in the American army and put in command of the army sent into Canada. He took possession of Montreal and St. Johns (Fort Chambly), and a large part of Canada, and rose to the rank of major-general. He drew up his forces in union with Arnold's troops before Quebec, Dec. 4, and when it was decided to carry the city by assault, Montgomery commanded the attack on the upper city. He fell dead at the first and only onslaught by the British, while pressing on the second barrier, Dec. 31, 1775. Congress erected a monument to his memory at St. Paul's church in New York.

Montmorency (*mont-mô-rĕn'sĭ* or *mon-mô-ron-sē'*), **Anne de,** first Duke of, marshal and constable of France, was born at Chantilly, March 15, 1492. He won distinction at the battle of Marignano, and was captured with Francis I. at the battle of Pavia in 1525. The king made him constable of France in 1538, but suspecting him of favoring the dauphin, he banished him from court in 1541. Under Henry II. he was restored to his honors and position, and commanded the French army in the defeat at St. Quentin, where he was again taken prisoner by the Spaniards. He was one of the three statesmen who opposed the influence of the regent, Catherine de Medici. He was captured a third time in 1562, in an attack against the Huguenots, and the next year drove the English out of Havre. He received a fatal wound in the battle against Condé at St. Denis, and died at Paris the next day, Nov. 12, 1567.

Montmorency, Falls of, are in the Montmorency river, eight miles below Quebec, where it empties into the St. Lawrence. The water falls over a precipice 250 feet high, and 50 feet wide. There is a series of natural steps above the falls worn by the water, and at the foot of the falls an ice mountain, sometimes 200 feet high, is formed every winter. It is a place of resort for tourists.

Montpelier (*mont-pĕl'yer*), is the capital of Vermont, and the chief city in Washington county. It is on the Onion river, 206 miles from Boston. It is built on a plain, surrounded by hills. It has a granite state house, with a statue of Ethan Allen, a Vermont seminary, a Methodist institution, and several mills, machine shops, and tanneries. Population 6,266.

Montpellier (*mon-pĕl'lyā*), a French city, 76 miles northwest of Marseilles, and six miles from the Mediterranean. The chief modern buildings are the theatre and law courts, and there are two great terraces used as promenades, with fine views of the Mediterranean, the Cevennes, Pyrenees, and Alps. Its great industry, the production of wine, at periods suffers by the phylloxera, a minute insect that attacks the vines and almost destroys the vineyards; the cure effected by grafting the vines upon American stocks was first tried here. There is a flourishing school of agriculture devoted to the study of wine and silk culture. Montpellier is more celebrated, however, as an ancient city, belonging to Aragon, or Navarre, before it finally became a French city in 1392. Its university (1289), with schools of law, medicine, and arts, rivaled that of Paris. Petrarch, Rabelais, and Casaubon, were pupils or teachers in its halls. A famous botanic garden, the oldest in France, was started in 1593, where De Jussieu and De Candolle, the well-known French botanists, studied and wrote. The university has passed its six hundredth anniversary and is well equipped. Population 73,931.

Montreal (*mont-rē-awl'*), the largest and chief commercial city of Canada, is built on

an island formed by the union of the Ottawa and the St. Lawrence rivers. The city is four miles long and nearly three in width. Its churches and schools are numerous, and some of them have very fine buildings. The Church of St. Peter's is like that at Rome, on a smaller scale; that of Notre Dame holds 10,000 people, and Christ church, Episcopal, has a tower 224 feet high. The large majority of schools are Catholic; the taxes paid by Catholics go to the Catholic schools, and those paid by Protestants to the Protestant schools. McGill university, the seminary of St. Sulpice, Presbyterian, Congregational, and Methodist colleges provide for higher education. There are musical, art, and historical associations. The city has an enormous commerce. Its canals enable it to trade with Duluth and Fort William on Lake Superior, Chicago

and Milwaukee on Lake Michigan, Buffalo and Cleveland on Lake Erie, and Oswego on Lake Ontario, while 1,500 miles of the St. Lawrence adds to its water routes on the way to the sea. It has large establishments engaged in boot and shoe making, clothing and tobacco manufactures, besides breweries, cotton mills, and sawmills. Montreal was founded by the French in May, 1642. Its early history was one of constant Indian wars, it being almost destroyed by them in 1660. In 1760, the French surrendered it to the British. During the Revolutionary war, it was occupied by American troops, who were driven out in 1777. Since that time the history of Montreal has been one of peace and prosperity. Population in 1901, 266,826.

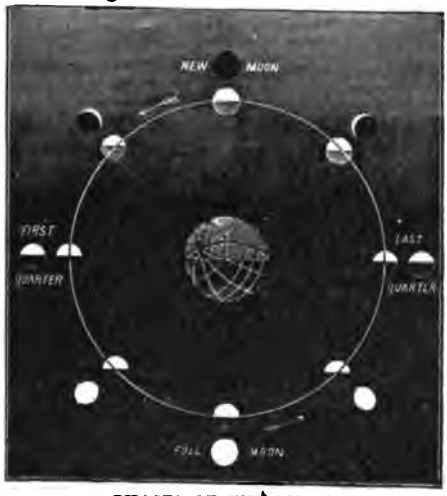
Mood'y Dwight Lyman, was born at Northfield, Mass., Feb. 5, 1837. In early boyhood he was thrown, with several other young children, upon the care of his widowed mother. At the age of seventeen he began a business career in Boston, where he attended Sunday school and soon became an earnest Christian convert. A young man of great enthusiasm and energy, he at once zealously embraced Christian work. Wishing to strike out a new path for himself, he went to Chicago. Here a tireless worker both in the store and the church, he settled down to the work of a "Sunday school scout," perhaps the roughest of all Christian service—the hunting up of ragged children in the worst parts of the city and winning them to school, and to a good life. Soon a deserted saloon was hired for a Sunday school, which Moody built into a great mission.

DWIGHT L. MOODY.

The breaking out of the war, in 1861, gave the evangelist a chance of doing great good, which was improved to the utmost. Backed by 150 ministers and laymen, he carried on a great revival among the soldiers at the recruiting camp near Chicago. Soon a call came from the field in the interest of the sick and wounded. Back and forth between Chicago and the various camps and battlefields Moody toiled and traveled; he was on the field after the battles of Shiloh and Murfreesboro, and was one of the first to enter Richmond.

Moody's great work was as an evangelist, but his many converts in Chicago, who had founded a church, forced him to become their pastor. But this charge could not keep him from carrying on those great revivals in all parts of the country which were so successful and which will always hold his name in remembrance. In 1870, and in 1883, with Ira David Sankey, he visited England, where his success was as great as it had been in America. Another great agency for good which we owe to Moody is the summer school for Bible study held at Northfield, where young Christian workers study the Bible, under the teaching of the foremost preachers and professors of America and Europe. Connected with this school is the institute for the training of young men for this same work, which was founded from the proceeds of the sale of Moody and Sankey's *Gospel Hymns*, the most popular hymn book ever published. Many of Mr. Moody's fine and practical sermons have been published. See *D. L. Moody and His Work*, by Daniels. He died Dec. 22, 1899.

Moon, a satellite of the earth and our nearest neighbor in the stellar universe. The



PHASES OF THE MOON.

distance of the moon from the earth varies from 221,614 to 252,972 miles. Its apparent mean diameter is 31′ 7″ so that its real diameter is 2,163 miles, and its volume only $\frac{1}{49}$ that of the earth. The mass of the moon, however, is only about $\frac{1}{80}$ that of the earth, which makes the acceleration of gravity at the surface of the moon only $\frac{1}{6}$ that of the surface of the earth. Professor Young illustrates this by saying that "a man on the moon could jump six times as high as he could on the earth and could throw a stone six times as far." The absence of any atmosphere or water on the surface of the moon has been proved by its appearance in the telescope, by the spectroscope, and by the absence of refraction in the occultation of stars.

The moon, like the sun, moves constantly toward the east among the stars; but it gains 12° 11.4′ daily on the sun. Accordingly the moon requires $\frac{360°}{12° 11.4'}$ days to gain one complete revolution on the sun. This length of

time, which is $29^d\ 12^h\ 44^m\ 2.7^s$ is called one *month*. This is also exactly the time required for one rotation of the moon upon her own axis. The consequence is that she always keeps the same side toward the earth. The other side of the moon is something that no inhabitant of the earth has ever seen. The reason why the period of the moon's rotation is exactly one month is a matter which is thoroughly understood — namely, tidal friction — but is too advanced for discussion in this place.

The various phases which the moon presents will be clear from the accompanying figure which represents the earth and the moon's orbit, illuminated by a sun at a great distance above the top of the page. When the moon lies exactly in the direction of the sun we say it is "new." In this position we see none of its illuminated hemisphere; but as the moon moves away from the sun's direction we see more and more of the illuminated portion. At the end of one week, half of the bright surface is seen by an observer on the earth, and we speak of this as a "half moon." A week later we see the complete illuminated hemispere and call it "full moon." The moon now begins to wane and passes through these same phases, in reverse order, until the next "new moon."

The moon has been in all ages — and is yet — the subject of many superstitions. Witness such words as *moon-struck* and *lunacy*.

Moon'stone. See FELDSPAR.

Moore, Sir John, an English general, was born at Glasgow, Scotland, Nov. 13, 1761, and died at Corunna, Spain, Jan. 16, 1809. He entered the army when only fifteen, and served at Corsica, in the West Indies, in Ireland, and in Holland. He obtained the order of the Bath for his services in Egypt in 1801. In 1802, he was with the army in Sicily and in Sweden, and in 1808 he was sent with an army of 10,000 men to strengthen the English army in the peninsula, and was put in command of the whole force soon after his arrival. The Spaniards failed to support him, and when, after the fall of Madrid, the news reached him that Napoleon with 70,000 men was marching against him, he began a retreat with his army of 25,000 men. They marched for nearly 250 miles through a mountainous country, almost impassable from snow and rain, and while embarking on their ships at Corunna were attacked by the French troops under Soult. The French were defeated with the loss of 2,000 men, but the brave leader was struck by a cannon-ball and died in the moment of victory, and was buried at night just before the troops embarked for England. The story is preserved in the well-known lines of the Rev. Charles Wolfe on the burial of Sir John Moore. See *Life*, by Moore; *Peninsular War*, by Napier.

Moore, Thomas, an Irish poet, was born at Dublin, Ireland, May 28, 1779. He was educated at Trinity college, Dublin, and in 1799 went to London, bringing out, in 1800, a translation of *Anacreon*, which, with his musical talent, opened to him the best society. His *Poetical Works of Thomas Little* (a pseudonym of Moore's) followed. In 1803, he was given an official position at Bermuda, which he visited, and appointed a deputy to his office, traveling afterward in the United States and Canada. He published, after his return, the earlier part of the *Irish Melodies*, and in 1817, *Lalla Rookh* appeared, and the whole English world applauded. He received $15,000 for the latter, and the *Irish Melodies* brought him $2,000 a year; but his deputy in Bermuda embezzled $30,000, of which sum he was obliged to pay $5,000, and in 1819 he departed for Italy to avoid arrest for the debt. He returned to England in 1822, spending the last thirty years of his life at Sloperton cottage in Wiltshire. His later works were a *History of Ireland* and lives of Sheridan, Byron, and Fitzgerald. He received a pension of $1,500 in 1835. His death occurred Feb. 25, 1852. See *Memoirs, Journal, and Correspondence*, by Earl Russell.

THOMAS MOORE.

Moors, a name given to the people living in Barbary, in northern Africa. Among them flourished the Christian church of Africa for three centuries, with Tertullian and Augustine as its leaders. The country was overrun by the Vandals from Spain in 429, and reconquered by the Byzantine emperors in 533. In 647, the Arabs subdued it, and the Moors became Mohammedans, and have so remained ever since. With the exception of Tripoli and Morocco, these countries now belong to France. The Moors have always been a mixed race. In history the name is given especially to the Arab conquerors of Spain from 711 to 1492. For a short time one caliph ruled from Bagdad to the Atlantic ocean. The Moors were finally driven from Spain in the reign of Ferdinand and Isabella (1492). They were far ahead of the people of northern Europe in architecture, literature, science, and agriculture; but after the 12th century they fell behind the Christian nations, who were developing rapidly, and their own divisions hastened their overthrow. See *Moors in Spain*, by Stanley Lane-Poole.

Moose. See ELK.

Moose'head Lake is situated in the state of Maine, the source of the Kennebec river. It is the largest lake in Maine, 35 miles long and from 3 to 12 miles wide. Spencer mountain, 4,000 feet in height, is on the eastern shore. There is fine game in the region, especially deer and caribou, which, with the attractive scenery, makes it a popular resort.

Moran (*mo-ran'*), **Thomas,** an American artist, was born at Bolton, in Lancashire, England, Jan. 12, 1837. His early life was spent at Philadelphia, where he learned engraving, studying painting afterward in England, France, and Italy. His large paintings, the *Grand Cañon of the Yellowstone* (7 by 12 feet in size), and the *Chasm of the Colorado*, were bought by congress for $20,000. These were the first landscapes ever purchased by the government. His other works are mostly of the same class: *Balboa discovering the Pacific*, *Hiawatha and the Serpents*, and *The Wilds of Lake Superior*, being examples of his paintings.

Mora'vians, a band of Protestants, formed from among the followers of John Huss, who claim to be the modern representatives of the ancient Bohemian church. They are called also "the church of the United Brethren." Their church was formed after the model of the apostles and early Christians; all distinctions of rank were done away with; they were opposed to taking the oath, or giving military service. The first formation of the church was in 1467, in Bohemia, increasing to between 300 and 400 churches in the beginning of the 16th century, when, from persecutions, many fled into Poland and Prussia. In 1600, they numbered among their followers two-thirds of the Bohemian nation, but were involved in the revolution of that period, and the church was almost destroyed. A few descendants of the old Moravians founded, in 1722, a colony at Herrnhut, in Saxony, on land given by Count Zinzendorf, and in 1727, formed anew their church. Their community was a pattern for other settlements in Germany, America, and Britain, often named for the mother colony, Herrnhut. Count Zinzendorf was one of their first bishops, and had much influence in deciding their customs of worship. They number now about 70,000 followers. The great distinction of the Moravians is their missionary zeal. Their first missions were started as early as 1732 in the West Indies, followed by mission work in Greenland, Lapland, North and South America, and Africa. Their missions among the American Indians were successful, one of their well-known stations being at Gnadenhutten, in Ohio, among the Tuscarawas. One out of every fifty members of the Moravian church is engaged in mission work, and there are three times as many members in their mission churches as in the home churches. The most abandoned, hopeless, and miserable people have been the first choice of the Moravian missionaries, as their missions to slaves, lepers, Indians, and gypsies testify. The Moravian church in the United States has about 15,000 communicants, 118 ministers, and 110 churches. Their great strength is in Pennsylvania. See *Missions*, by Thompson; Hutton's *Short History of the Moravian Church;* and *History*, by Bost (English translation).

Mor'ay, or **Mur'ray, James Stuart,** Earl of, Scottish regent, illegitimate son of James V. of Scotland, was born about 1533. In 1556, he joined John Knox and the reformers, and became the head of the Protestant party in Scotland. When Mary Queen of Scots returned to her kingdom, he acted as her prime minister. He opposed her marriage to Darnley, in 1565, and contested it with an army, but was defeated, and fled to England, not returning to Scotland until after Rizzio's murder, in which he seems to have been involved. He was recalled from France in 1567, to find Mary in prison and himself regent of the kingdom. After his escape, he defeated her forces at Langside, near Glasgow, May 13, 1568, and was one of the commissioners sent to England to make arrangements for her safe custody, and testified against her when tried for the murder of Darnley. He managed Scotland well, but was shot from a window, Jan. 21, 1570, by Hamilton, of Bothwellhaugh, either from personal enmity, or at the suggestion of Mary's friends. See *History of Scotland*, by Robertson.

More (*môr*), **Hannah,** was born near Bristol, England, in 1745. She wrote verses when very young, publishing a drama, *The Search for Happiness*, when only seventeen years of age. This was followed by two tragedies, *Percy*, and the *Fatal Secret*, both of which were acted. She visited in London, going much into society, and making friends of Johnson, Sir Joshua Reynolds, the Garricks, and others, but became dissatisfied with her life, and retired to a cottage near Bristol. She continued her literary work, but gave much of her time to helping the poor, and originating schools for them. Her novel, *Cœlebs in Search of a Wife*, and the tract, *The Shepherd of Salisbury Plain*, are the most popular of her works. The tract has had an enormous circulation. She made by her writings $150,000, leaving one-third of this sum to charitable objects. She died, at Clifton, Sept. 7, 1833. See *Life*, by Roberts, and one by Yonge.

More, Sir Thomas, English statesman and author, was born at London in 1478. He acted as page, according to the fashion of the times, in the house of Archbishop Morton, who said to his guests, "This child waiting at the table will prove a marvelous man." At Oxford, he met Livacre and Colet, who

had traveled in Italy, and brought with them the new ideas and learning of the time. More, already a fine Latin scholar, studied Greek with Livacre, and from Colet received a spiritual impulse, which made him ready for his famous friendship with Erasmus, whom he met about 1498. When Henry VIII. came to the throne, More was already known as one of the leading scholars of the time, had been in parliament, and acted as ambassador to the Netherlands, so that Henry naturally gave him public office. Although disinclined toward public life, he rose rapidly, becoming treasurer of the exchequer, speaker of the house of commons, and, on the fall of Wolsey, in 1529, lord chancellor. The king became intimate with him, making unexpected visits at his home at Chelsea, but when congratulated on the king's friendship, More replied, "If my head would win him a castle in France, it should not fail to go." He was sent on embassies to Francis I., and Charles V. As chancellor "he was ready to hear every man's cause, poor and rich," and the only fault found has been with his decisions in religious matters. Like Erasmus and Colet, while welcoming reforms, he did not desire to leave the old church. He parted with Henry on the question of the divorce of Catherine of Aragon, and refused to take the oath acknowledging Henry as head of the church. He was beheaded on Tower Hill, London, July 6, 1535. The story of his daughter Margaret's midnight ride, with only a half-foolish jester for companion, to London bridge, where her father's head was exposed; holding out her apron, as she sat in the boat, while the head was dropped into her lap, to be carried off for burial, is one of the most touching in English history. Sir Thomas More ranks high among the writers of England. His works were generally written in Latin; his *History of King Richard III.*, however, in 1513, was written in English, and is perhaps the first example of classical English prose. His great work, *Utopia*, in Latin, made him the one literary Englishman of the 16th century who was known and admired on the continent. It was translated by Bishop Burnett in 1556, and still holds its place as an English classic. See *Life*, by Roper; *Lives of the Chancellors*, by Campbell; and *Household of Sir Thomas More.*

Moreau (*mo-rō'*), **Jean Victor,** one of the greatest of French generals, was born Aug. 11, 1761, in Brittany. In the revolution, he served first under Dumouriez, and was soon made commander of a division, taking an active part in reducing Belgium and Holland. In the spring of 1796, he was given the chief command on the Rhine and Moselle, driving the Austrians back to the Danube, and regaining the Rhine in a retreat that gave him more reputation than all his victories. In 1798, he saved the French army in Italy from destruction, when hard pressed by the Russians and Austrians. His command was given to Joubert, but at his request, Moreau remained with the army, and after Joubert's death, he brought the defeated troops to France. He was offered the dictatorship, but declined, giving his help to Bonaparte. Again in command of the army of the Rhine, he gained victory after victory over the Austrians in 1800, ending with the great battle of Hohenlinden. Napoleon, possibly moved by jealousy, accused him of taking part in a plot against his life, and had him tried. The evidence against him was insufficient, but he was exiled, and came to America in 1804. In 1813, while with the emperor of Russia, and the king of Prussia, in their march on Dresden, he was struck by a cannon-ball, and died at Laun, in Bohemia, Sept. 2, 1813. See *Memoirs* by Philippart.

Mor'gan, Edwin Dennison, an American statesman, was born at Washington, Mass., Feb. 8, 1811. Beginning life as a boy merchant in Hartford, Conn., he, some years later, transferred his business to New York city, from which place he was elected to the state senate in 1850, and he became, at the organization of the Republican party, one of its active and trusted leaders. In 1858, he was elected governor of the state, and he served in that capacity through the critical first years of the Civil war, becoming United States senator in 1863. During his term of office he assisted in the raising and sending to the front of 220,000 volunteers. He was offered the position of secretary of state by President Lincoln, in 1865, and that of secretary of the treasury by President Arthur in 1881; but he declined both. By will he left $795,000 to charities, having during his lifetime also given away vast sums. He died at New York, Feb. 14, 1883.

Mor'gan, John Hunt, a Confederate general, was born at Huntsville, Ala., in 1826. In the Civil war he took the Confederate side; was a bold and successful raider, and his troops were the terror of the border regions, and known as "Morgan's Guerrillas." He is celebrated for what is known as Morgan's raid, in which, crossing the Ohio, he dashed through southern Indiana and Ohio, but was captured while recrossing the river, and confined in the Ohio penitentiary. After his escape, he led another raid into Tennessee, but was surprised and killed at Greenville, Tenn., Sept. 4, 1864.

Mor'gan, John Pierpont, an American financier,— son of Julius S. and his wife, the daughter of John Pierpont,—was born at Hartford, Conn., April 17, 1837. He was educated at the high school in Boston and the University of Göttingen, Germany. He began his career as a banker in 1857, in New York city; and in 1860, was appointed the American agent of the London firm of George Peabody and Company. In 1864, he became one of the firm of Dabney, Morgan and Com-

pany; and in 1871, he became a partner of the Drexels. He took a lively interest in railroad management, being director in a number of roads and active in the reorganization and successful development of lines that had failed in other hands. In 1895, he successfully conducted a syndicate formed for the purpose of purchasing United States four per cent. bonds. Mr. Morgan became director in no less than 23 railroad companies by 1900, and it was through his efforts that the great steel manufacturing interests of the countries were combined into a company having a capital of $1,100,000,000. In 1901, he purchased three lines of ocean steamers, and he is at present engaged in the largest financial transactions which have ever been entered into by private individuals.

JOHN PIERPONT MORGAN.

Mor'gan, John Tyler, an American soldier and statesman, was born at Athens, Tenn., June 20, 1824; emigrated to Alabama in 1833; was admitted to the bar in 1845; became a delegate to the Alabama Secession Convention in 1861; joined the Confederate army in 1861, and, passing through all grades from private upward, was made brigadier-general in 1863, and served to the close of the struggle. In 1877, he was elected to the United States senate. In 1892, he was appointed arbitrator on the Bering sea fisheries by President Harrison. In 1898, he was appointed by the late President McKinley one of the commissioners to organize a territorial government in Hawaii.

Morgarten (*môr-gär'ten*), a mountain on the border of Lake Egeri, in Switzerland, near by which is the scene where 1,400 Swiss from the cantons of Schwyz, Uri, and Unterwalden won a great victory over 15,000 Austrians, Nov. 15, 1315.

Morghen (*mor'gen*), **Raphael Sanzio Cavaliere,** a famous Italian engraver, was born at Naples, June 19, 1758. He studied at Rome, and his first works were very successful. Almost all of the great masterpieces of art of the time were engraved by him, Raphael's *Transfiguration* and Da Vinci's *Last Supper* being among them. He made his home at Florence, in response to an invitation of the duke, who gave him a pension and a house, on condition of his establishing a school of engraving. His *Transfiguration*, upon which he spent sixteen years of labor, was dedicated to Napoleon, who paid him much attention. His life and a catalogue of 254 of his engravings were published by a pupil. He died at Florence, April 8, 1833.

Mori'ah, Mount, a hill in Palestine, forming a part of the site of the city of Jerusalem. Solomon's temple was built upon it, and at its foot, in the valley of Jehoshaphat, is the Virgin's Fountain, an intermittent spring from which the water flows through an aqueduct cut into the mountain into the Pool of Siloam. When the temple was destroyed, at the taking of Jerusalem, Mount Moriah was literally plowed over. It is now the site of the great mosque of Jerusalem, which occupies about one-seventh of the present city.

Mor'ley, Henry, an English author and educator, was born at London, Sept. 15, 1822. He was a student at King's college and afterward in Germany. He practiced medicine from 1844 to 1848. For two years he was an instructor, and for some years later a journalist. He was lecturer upon English literature in King's college, London, from 1857 to 1865; and from 1865 to 1889 was professor of English language and literature in University college, London. He resigned the latter position in 1889. He published *Palissy the Potter* as early as 1852, and up to his death, in 1894, was continuously engaged upon some literary work. In 1864, he began a series of works to illustrate all schools of English literature. He also edited for Cassell's National Library over 200 volumes, and for Routledge and Son a series of 63 volumes known as *Morley's Universal Library*. Another series of 14 volumes, *The Carisbrooke Library*, he issued later. Few writers have been more industrious, prolific, or reliable as to fact and judgment than he. He died at Carisbrooke, England, May 14, 1894.

Mor'ley, John, an English statesman and writer, was born at Blackburn, Lancashire, Dec. 24, 1838, and was educated at Oxford. He chose literature as a profession, writing *Edmund Burke*, *Walpole*, *Rousseau*, *Voltaire*, *Richard Cobden*, an essay on *Compromise*, and *Critical Miscellanies* among others, and editing from 1867 to 1882 the *Fortnightly Review*. He was also the editor of the "English Men of Letters" series. From 1880 to 1883, he was editor of the *Pall Mall Gazette*. In 1880, he entered parliament as a Liberal, where his speeches in favor of home rule, as well as his newspaper articles, did much to influence public opinion. In 1886, he was Irish secretary for a short time. He supported Gladstone in 1890, and from 1892 to

RT. HON. JOHN MORLEY.

1895, was secretary for Ireland. He is popular as a public speaker; and opposed the Salisbury government in undertaking the Boer war in South Africa.

Mormons, called also "latter-day saints," constitute a peculiar religious community. Their belief is founded upon revelations said to have been made to a young man, named Joseph Smith, living at the time in Manchester, N. Y. Born in 1805, in Vermont, he was fifteen years of age when in 1820 he had his first vision; his call, as he considered it, to the work of a prophet. This was followed in 1823 by a revelation of the place where he would find the sacred book of the Mormons. In 1827, the books were put into his hands with two silver plates, called the Urim and Thummim, looking like a pair of spectacles, by means of which he read the unknown language of the books, dictating it to his friend, who wrote it down. Eight persons were permitted to see the original book and the silver plates, which then were returned to the angel Gabriel, who had brought them. Such is the story of the origin of the Book of Mormon, the first edition of which was published in 1830, at Palmyra, N. Y. The name comes from Mormon, the prophet who was commissioned to write the history of his people, a race said to have come from Jerusalem to America, about 600 B. C.; which records constitute the book. It is considered by the Mormons to be of equal authority with the Bible, and the latest revelation from God. The Mormon church was organized in Fayette, N. Y., April 6, 1830, with six members. Converts soon were numerous, and branches were founded in New England, Ohio, and Pennsylvania. In 1831, they formed a colony in Missouri, at a place revealed to them as the site for their capital city. Here, and in Ohio, they were persecuted, their printing presses destroyed, their bishops tarred and feathered, and finally the Missouri colony was driven out entirely. A company went to England in 1837, and made 2,000 converts in a short time. They prospered in their new home in Missouri, their city named Far West, to which most of the Ohio Mormons had gone; but a popular rising against them, in August, 1838, led to their being driven from the state by order of the governor. They founded in Illinois the city of Nauvoo in 1838, about twelve or fifteen thousand of them coming into the state, where they were kindly received. But in a few years the popular dislike broke out afresh, the prophet and his brother, when in prison with others at the command of the governor of the state, were shot by assassins.

Brigham Young, one of the twelve heads of the church, or "apostles" as they call them, came to the leadership, and with a thousand families left Nauvoo in February, 1846. They wintered in Nebraska, and in the spring of 1847 Young, with a band of 143 men, set out for the Rocky mountains, reaching the Great Salt lake, the site of their new city, in July. Others followed in the autumn and the next year. They have now settlements in Idaho, Colorado, New Mexico, and Arizona, besides Utah, in the United States, and also in Mexico and British America. Utah has been a territory of the United States since 1850, and for several years Brigham Young was governor. The Mormons number about 300,000, 110,000 of them being in Utah. They are said to have 796 churches and 1,700 ministers. A new and reformed sect of Mormons have their chief seat at Lamoni, Iowa. The opposition to them in the different states where they settled, and the refusal of the United States government of their request that Utah be then made a state, was due to two of their doctrines or practices: viz, the oath binding them to obedience to their spiritual head in everything, which prevents their obedience to the laws of the country if there is at any time any conflict, and their belief in and practice of polygamy, *i. e.*, having several wives. They were also credited with secretly murdering any one who opposed their practices or revealed their acts, and though the popular impression in this respect was exaggerated, the "Mountain Meadow" massacre of a band of "Gentile" emigrants in 1857, shows that it was not entirely without foundation. President Woodford, as the head of the church in September, 1890, in a proclamation, declared that polygamy is no longer the doctrine of the Morman church. See *History of Utah*, by H. H. Bancroft, and *Early Days of Mormonism*, by Kennedy.

Morocco (*mō-rok'ō*), a country in the northwest of Africa, a Mohammedan empire, consisting of the kingdoms of Fez, Morocco, and the territories of Sus, Adrar, Draa, and Tafilet, under a reigning sultan, whose government is practically a despotism. It contains about 219,000 square miles, of which the Desert of Sahara occupies over 200,000. The Atlas mountains cross it in several ranges from southwest to northeast, making a large part of the country hilly. There are rich, level plains in parts of the country, and though the soil is sometimes thin in the western part, most of it is of use for pasturage, and there is little real desert. The rivers of Morocco, in the wet season rolling full from bank to bank, are in the hot season not much more than pools connected by threads of water, and are none of them navigable for any distance. Parts of Morocco, where the sea breezes prevail, and the Atlas mountains protect from the hot winds of the desert, are temperate; but the interior valleys are very hot in summer, and in winter ice and snow are not uncommon. The products are those of temperate and tropical countries. Wheat, barley, corn, oranges, figs, lemons, and dates are among the exports, while cotton is grown for home use. The cultivation of tobacco and its use are forbidden by the sultan, and no

animal can be sent out of the country without his majesty's permission. The animals resemble those of southern Europe, save a few species which come from the regions of Africa to the south. The mineral wealth is almost unknown, as the interior of the country has not been explored, but gold, silver, copper, tin, iron, coal, and petroleum are evidently abundant. The mines are scarcely touched, and no European is allowed to visit them. The people, numbering anywhere from 2,500,000 to 9,000,000, are divided into six groups; the Berbers, who inhabit the mountain regions, are the original inhabitants; the Arabs, descendants of those who invaded the country in the 7th century; the Jews, who settled early in the region, with many refugees from Spain and Portugal; a few Europeans, mainly Spaniards, confined to the coast towns; the Moors, a name given to all the Mohammedans, but really belonging only to Arabs with a mixture of Spanish blood, found mostly in the large cities; and the negroes, who were brought from the Sudan as slaves. There are three capitals — Fez (population 140,000), Morocco, and Mequinez; the seaports are on the Atlantic, Mogador, and Tangier, and on the Mediterranean, Tetuan, etc.

Morocco was for four centuries a part of the Roman empire, and fell into the hands of the Vandals in 429 A. D., until, in 533 A. D., it passed to the Eastern empire. Since 680 it has been most of the time in possession of the Arabs, and the people have been Mohammedans. It was first a part of the "caliphate" of Bagdad, then divided into several independent monarchies, which, after civil wars and revolutions, became united in one kingdom under Mulai-Ismail, who reigned from 1692–1727. The country is still very backward, and though the enslaving of Christians and piracy were done away with in 1817, the interior is almost inaccessible, and slavery still exists. See *Tour in Morocco*, by Hooper and Ball; *Land of an African Sultan*, by Harris.

Moroc'co, the southern capital of the sultanate of Morocco, is situate at the northern end of a fertile plain, 1,447 feet above the sea. It is surrounded by an earth wall, from 20 to 30 feet high, with square towers at intervals, and seven gates, said to have been brought from Spain. It has the remains of former greatness, but is poorly built, with low, flat-roofed houses without windows, and narrow, unpaved, and dirty streets. It carries on a considerable local trade, though much less than Fez, with several tanning and leather-dyeing establishments. The palace is outside the city, its grounds covering 180 acres; no Europeans live within the city walls. The city was founded in 1072, and in its greatest prosperity, in the 13th century, it contained more than 700,000 inhabitants. It has been sacked more than once in the civil wars, and has steadily declined. Its situation in sight of the Atlas mountains, and its command of the trade routes, make it probable that it will regain its former greatness whenever the country is well governed. Population 50,000.

Morpheus (*môr'fûs* or *môr'fē-us*), in mythology, the son of sleep and the god of dreams. The word means "molder," and he is so called because he molds or shapes the visions of the sleeper. He is represented as an old man with wings, pouring a sleep-producing vapor out of a horn, and sometimes as lying down with a crown of poppies on his head.

Morphology (*môr-fŏl'ō-jy*), in botany one of the great divisions of the subject, which treats of the forms of plants. The older idea of morphology was that it had to do merely with the adult organs, and that it considered merely the various forms of leaves, stems, roots, etc. As at present developed, morphology treats also of the development of organs. For example, it is not content with describing the mature leaf or the mature archegonium, but it states in detail the development of these organs from their most primitive conditions. It includes, therefore, what may be called "organography," that is, the development of organs, and also "embryology," that is, the development of the plant as a whole. Morphology is also closely identified with the relation of plants to one another by descent, and is therefore bound up with what is called "phylogeny," which means a consideration of the ancestral forms of plant races. From this point of view morphology is also the most fundamental contributor to "taxonomy" or classification, which can only be natural when it expresses the real morphology of plants. In any botanical study morphology is regarded as most fundamental, for it underlies all other work with plants.

JOHN M. COULTER.

Mor'rill, Justin Smith, an American statesman, was born in Orange county, Vt., April 14, 1810. He had only a common school education as a boy, and at an early age he engaged in business, which later he gave up for farming. He was elected to congress in 1855, remaining in the house of representatives from 1855 to 1867, at which time he was elected to the United States senate, and later was re-elected for six successive terms of six years each. His congressional service exceeded in length that of any living colleague. He held for many years in the house the important position of chairman of the committee of ways and means, and he was the author of the tariff bill of 1861 known by his name. He wrote *Self-Consciousness of Noted Persons*, published in 1886. He died Dec. 28, 1898, at the capital of the nation.

Mor'ris, Gouverneur, an American statesman, was born at Morrisania, N. Y., Jan. 31, 1752. He was active in political matters during the Revolution. From 1781–84, he was assistant to Robert Morris, who was superintendent of the national finances. In 1787, he

was a member of the convention that framed the United States constitution. He spent part of the year 1791 in England as confidential agent of Washington, and was minister to France till 1794. He was three years (1800–3) United States senator from New York. He died Nov. 6, 1816. See *Gouverneur Morris*, by Roosevelt, in "American Statesmen" series; *Diary and Letters*, by Anne Cary Morris.

Mor'ris, Sir Lewis, an English poet of Welsh origin, who was knighted in 1895 for his verse, was born in 1832, at Carmarthen, Wales, studied at Oxford, and practiced law until 1881, when he was appointed secretary of the University of Wales. His first poems, *Songs of Two Worlds*, published under the name "A New Writer," were very popular, passing through several editions. His *Epic of Hades*, appeared in 1876, and since then, *Gwen, a Drama*, *The Ode of Life*, *Songs Unsung*, *A Vision of Saints*, *Songs without Notes*, and *Idylls and Lyrics*, all of which have been popular.

Mor'ris, Robert, one of the signers of the Declaration of Independence, was born in Lancashire, England, Jan. 20, 1734. He came to America when he was thirteen years old, and entered a counting house at Philadelphia, becoming finally a partner. He opposed the Stamp Act and was elected to the congress of 1775. He voted at first against the Declaration of Independence, but signed it when it was adopted. He was again in congress in 1777 and managed largely the finances of the country. In 1781, he was elected superintendent of finance, and had almost entire control of the money operations of the new government. He established the Bank of North America in 1782, and in supplying the army in 1781 issued his own notes for over $1,000,000, which were finally repaid. He resigned in 1784, declining in 1788, when senator, the secretaryship of the treasury offered him by Washington. From 1789 to 1795 he represented Philadelphia in the United States senate. He, with Gouverneur Morris, sent the first American vessel to Canton in 1784. He lost his fortune by speculation, and was confined in prison for debt during the last years of his life. He died at Philadelphia, May 8, 1806.

Mor'ris, William, an English poet, was born near London in 1834. Educated at Oxford, he became intimate with the painter, Burne-Jones, and studied painting himself. In 1858, appeared his first volume of poems, *The Defense of Guenevere, and Other Poems*, which was scarcely noticed, though the work that will give him a name in the future; his long poem, *The Life and Death of Jason*, in 1867, attracted attention, and *The Earthly Paradise* confirmed his reputation as a poet. His later publications are *Love is Enough*, *Fall of the Niblungs*, and translations from the Icelandic. His socialistic writings and speeches occupied him of late years, to the exclusion of poetry. His name is also identified with the household decorations, wall papers, tiles, and stained glass, manufactured by the establishment founded by him in 1863, and which are well known in all art circles. His lectures on *Hopes and Fears for Art* were published in 1882. He died at London, Oct. 3, 1896.

WILLIAM MORRIS.

Mor'rison, Robert, the founder of Protestant missions in China, was born in Northumberland, England, Jan. 5, 1782. He was sent out in 1807 by the London Missionary society to Macao and Canton. In 1814, he had translated into Chinese and printed the New Testament, and four years later the Old Testament, with the help of an assistant. In 1823, as translator for the East India company, he printed the Chinese dictionary in six volumes, at an expense to the company of $60,000. It was the work of sixteen years, and in working on it he collected a library of 10,000 Chinese books. The dictionary was afterward translated into Japanese. He established an Anglo-Chinese college at Malacca. He visited England in 1824 and presented his Chinese library to University college, London. While acting as interpreter to Lord Napier he died at Canton, China, Aug. 1, 1834. See *Memoirs*, by Mrs. Morrison; *Robert Morrison*, by Townsend.

Mor'ristown, N. J., the capital of Morris county, and a place of much historic interest during the Revolutionary war, is situated in northern central New Jersey, 30 miles west of New York city. It is at a high elevation, and is the home of a number of New York merchants. Here is the famous Ford mansion, occupied by General Washington, and now the property of the State Historical society. It is reached by the Delaware, Lackawanna, and Western railroad. At Morris Plains, near by, is the New Jersey State Lunatic asylum. It is a city of schools, seminaries, hospitals, churches, libraries, banks, etc., and has all the equipment of a growing civic center. Population 11,267.

Morse, Samuel Finley Breese, an American inventor and artist, was born at Charlestown, Mass., April 27, 1791. He graduated at Yale college, and studied painting in England in company with Allston and West. His first success in sculpture, *The Dying Hercules*, brought him a gold medal from the Adelphi Society of Arts. He was president of the

National Academy of Design from 1826 to 1842, and became professor of the arts of design in the University of New York in 1835. On a voyage from Havre to New York, in 1832, the idea of a magnetic telegraph first

SAMUEL MORSE.

occurred to him as the result of his studies in electricity. He made several successful experiments in 1835, working a line of half a mile around his room. He applied to congress in 1837 for aid to build a line from Washington to Baltimore, and tried to obtain patents in England and in France. He struggled on with scanty means, until at midnight, in the last hours of its session, in 1843, congress made an appropriation of $30,000 for the line to Baltimore, which was in working order in 1844. The first submarine telegraph lines were also laid by him in New York harbor in 1842, and in 1843 he wrote to the secretary of the treasury, suggesting a telegraph across the Atlantic. His system was adopted throughout Europe, and every European government honored him with decorations and finally, through the influence of Napoleon III., presented him, as an international gift, in honor of his work, $20,000. Becoming acquainted with Daguerre, in Paris, he learned the new art of taking pictures, and made the first daguerreotype apparatus in America. He died at New York, April 2, 1872. See *Life*, by Prime.

Mor'tar. See ARTILLERY.

Mor'tar. See CEMENTS.

Mor'ton, Levi Parsons, ex-Vice-president of the United States (1889–93), was born at Shoreham, Vt., May 16, 1824. He was first clerk in a country store and then partner in a merchant's firm at Boston. In 1863, he founded banks in London and New York, and for a time was at the head of one of these — the house of Morton, Bliss & Co. In 1878 and 1880, he was sent to congress, and from 1881 to 1885 was minister to France. He was elected Vice-president in 1888, his term ending in March, 1892.

Mor'ton, Oliver Perry, the "war governor" of Indiana, was born in Indiana, Aug. 4, 1823. He studied at Oxford, O., and practiced law in Indiana. In 1860, as lieutenant-governor, he succeeded Governor Lane, in the governorship of Indiana, Lane being elected United States senator. He became famous in the next four years as one of the "war governors," raising

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troops, and borrowing money on his own notes to carry on the state government. He was re-elected in 1864, became United States senator in 1867, and again in 1873. He was influential in congress, serving on important committees and advocating the 15th amendment to the constitution. He died at Indianapolis, Nov. 1, 1877, having been a cripple from paralysis since 1865.

Mosaic (*mo-zā'ĭk*) is the name given to the art of producing designs in colored stones or glass, by the use of small pieces made to fit together, and held in place by cement. The pattern or picture becomes thus practically indestructible. This art flourished during the palmy days of Rome, being used for floors, walls, and ceilings alike. It was revived under the Byzantine empire, especially for churches; and came into great popularity again in Italy during the middle period of the 13th century. In the workshops connected with the Vatican, workmen are constantly engaged in reproducing in mosaic the pictures of world-renowned artists, using not simply marbles of natural colors, but glass and artificial stones, especially prepared and exquisitely tinted for this purpose. Very striking effects are produced by the use of glass backed with gold or silver, or colored like sea shells. Not only have the Russians greatly excelled in modern mosaics, but Americans also, and some of the finest designs ever produced are to be found in American public library buildings, notably at Washington and Chicago. Florentine mosaic, used chiefly for jewelry, personal ornaments, and paper weights, is composed of shells or stones of natural colors cut in much larger pieces than are employed in Roman mosaics. The demand for mosaic work increases every year, and skill in the use of the materials employed will doubtless bring the art to great perfection in our own country.

Mosby (*mōz'bĭ*), **John Singleton,** a noted Confederate soldier, was born at Edgemont, Powhatan county, Va., Dec. 6, 1833. He studied at the University of Virginia, and

was admitted to the bar in 1855. At the outbreak of the Civil war he was practicing law at Bristol, Va. He entered the Confederate army as private, but soon became adjutant in the cavalry service, and by 1862 was colonel, operating an independent command whose special work was the cutting communications between the Federal front and its base of supplies, and capturing exposed cavalry outposts. The swiftness and daring with which Colonel Mosby operated made him greatly dreaded in the valley of the Shenandoah. At the close of the war he returned to the practice of law. He became a Republican and supported Grant for the presidency in 1872. He was appointed by President Hayes consul at Hong Kong in 1878, where he remained on duty till 1885. He was removed by President Cleveland, and returning to the states made San Francisco his home. In 1901, he was appointed United States land agent and assigned to duty in Nebraska.

Moscow (*mos'kou*), a city of Russia, and its former capital, is situated in the center of European Russia, on the river Moskva, 403 miles southeast of St. Petersburg. It covers 40 square miles. The Kremlin (citadel), in the center, is an inclosed space surrounded by walls with eighteen towers, and is the most sacred spot in the Russian empire. All who enter by the "Saviour" gate must bow to the image of the Saviour that stands above it. Inside the walls are three cathedrals, many churches and monasteries, the great tower, four palaces, an arsenal, and the hall of the synod, with a fine library. The cathedrals have fine mosaics and jeweled ornaments and choice pictures, and have been the burial places of several of the Russian czars. The tower, built in 1600, is 270 feet high, commands a magnificent view of the city, and at its foot is the bell called "king of bells." Before the arsenal is a pile of 800 or 900 French cannon, the trophy of 1812. Outside of the Kremlin is the Cathedral of St. Basil (1554), the historical museum, the great bazaar, the university, founded in 1755, with a library of 200,000 volumes, and 4,407 students, and a public museum with fine collections, a picture gallery, and a library numbering over 300,000 volumes. It is the busiest city in Russia except St. Petersburg, and has numerous manufactures of cotton, silk, and woolen goods, leather, tobacco, candles, carriages, pottery, and matches. Its situation in the center of European Russia, between the Baltic and the Black seas, makes it a great commercial market, and it carries on an extensive trade in grain, timber, furs, hides, tallow, tea, sugar, and in the mineral products of the country.

Moscow was first occupied by the Finns, and settled by the Russians in the 12th century. The Mongols sacked the town in 1237 and 1293, but by the 14th century it had become firmly established, and became in 1325 the seat of the church officers for central Russia. The Kremlin was built in 1300 and was walled in 1367. Moscow continued growing in influence and power and in 1462 its prince, Ivan III., took the title of czar of Russia. In 1547, it was burned down, and again in 1571 it was taken and burned by the khan of the Crimea, and otherwise suffered from the Mongols in 1591. St. Petersburg was made the capital of Russia by Peter the Great in 1713, but the old families and the peasantry still consider the holy city of Moscow as the real capital. The city suffered from fires again in 1739, 1748, 1753, and was finally, in 1812, set on fire and burned by its own citizens to save it from being taken by Napoleon. Since then it has been largely rebuilt. Population 988,614.

Moselle (*mō-zel'*), a branch of the Rhine, rises in the Vosges mountains in France. It passes through Luxemburg and Rhenish Prussia and joins the Rhine at Coblentz. It is 315 miles in length, about 100 miles being navigable.

Mo'ses, the great lawgiver and leader of the Hebrews or Israelitish nation, was born in Egypt, probably about the first half of the 14th century, B. C. The Hebrews were at the time under the power of the Egyptians, and lived in the eastern part of the Nile delta. His early life was spent at the court of Egypt, as the adopted son of Pharaoh's daughter, where he became learned in "all the wisdom of the Egyptians." Driven into the wilderness as a consequence of his killing an Egyptian while protecting a fellow Hebrew from his cruelty, he spent forty years as a keeper of flocks, until called back to lead his people out of Egypt. The story of the exodus, and the forty years' wandering in the wilderness, the giving of the law on Mount Sinai, the fixing of the ceremonies of the new race, the patient endurance of their waywardness and fickleness, until his solitary death and the unknown grave in Mt. Nebo, with only a view of the promised land to which he had led his people, are related in the first five books of the Bible, called the books of Moses. See *Moses, His Life and Times*, by Rawlinson, and Graetz's *History of the Jews*.

Mosquito (*mŏs-kē'tō*), a gnat-like, two-winged insect, the female of which punctures the skin of man and animals and sucks blood. The names gnat and mosquito are often used interchangeably, but gnat has a wider scope. The mosquito is a form of gnat, but there are others like the gall-gnat, buffalo-gnat, etc., to which the name mosquito will not apply. The mosquitoes are to be distinguished from all other kinds of gnats by having a fringe of scale-like hairs on the wings, and, in American forms, these are also found on the wing-veins. The female mosquito is the one that sings and bites; the males are said to feed on the sweets of flowers. The apparatus for puncturing the skin and sucking blood con-

sists of six slender pieces, united in a case, and forming a sharp stylet. These pests are distributed not only in tropical and temperate regions but, during the warm season, in Lapland, Siberia, Canada, etc. They abound in regions around the Lake of the Woods and drive hunters, horses, and cattle to distraction with their bites. The life history of the common mosquito is as follows: The eggs, to the number of four or five hundred, are deposited by a single mosquito, in the form of a float or raft, in any standing water. The eggs soon hatch into wigglers, or larvæ, which feed upon decaying matter in the water. The wigglers breathe by an air-tube in the posterior part of the body, and it is necessary for them to come to the surface for air every two or three minutes. The larvæ soon pass into a pupa stage from which the perfect insect emerges. Mosquitoes have unusual interest to medical men, since it has been recently shown that they are connected with the spread of malaria, jungle fever, Roman fever, and yellow fever. The more common mosquito of the genus *Culex*, does not carry malaria, but a closely-related form, with spotted wings, belonging to the genus *Anopheles*, carries the contagion. Malaria is produced by a minute parasite (a protozoon), which lies within the red blood corpuscles. When mosquitoes bite a person affected with malaria, they introduce into their own bodies many of these minute germs with the blood. There, the parasites undergo a secondary development, and, the infected mosquitoes, when they bite again, carry the disease. This is the only known way of transmitting malaria. Yellow fever is also carried in a similar way. The disease is not transmitted by the clothing of the sick, nor by contact with their bodies. To prevent the spread of these diseases it is important to get rid of the mosquitoes. Various means of combating them have been adopted. Draining marshy lands, introducing fish into the water, that feed upon the wigglers, and covering the surface of standing water with kerosene. The latter is the most effective. Oil dropped upon the water will spread as a film over it. When the wigglers come to the surface to breathe, the oil gets into their breathing tubes and they are thereby killed. See Howard's *Malaria and Certain Mosquitoes*, *Century Magazine* (April, 1901); *Mosquitoes* (New York, 1901); Sternberg's *The Transmission of Yellow Fever by Mosquitoes*, *Pop. Science Monthly*, July, 1901.

LIFE HISTORY OF THE MOSQUITO.

(a) Larva. (b) Pupa. (c) Insect emerging. (d) Male Mosquito. (e) Female Mosquito.

Mosqui'to Coast was formerly an independent state under the protection of Great Britain. It lies on the east side of Nicaragua, to which it now belongs. The land on the coast is swampy, but the mountain regions in the interior are healthy. The people are a mixed race, part Indian and part African, and number about 15,000. It was discovered by Columbus in 1502, and claimed by Spain. It was the home of the buccaneers in the 17th century, and subject to Britain from 1655 to 1850. The Mosquito Reserve (assigned to the mixed race of Indians) forms one of the departments of the republic of Nicaragua, and now bears the name of Zelaya.

Moss. See Musci.

Moss'es, a large class of flowerless plants. Found in all climates, they are most abundant in temperate regions and damp places. A moss plant consists of a stem with leaves and roots. Roots will grow out from any part of the plant. The plant produces what are called moss flowers, something like a bud, but which is really an egg cell; from the egg grows another plant, which remains on the parent plant, and which produces spores or seeds, when usually the mother-plant dies. In mountain regions there are thick beds of moss which soak up the rain and often prevent floods. The beds of moss which are seen growing to-day in bogs are the tips of plants which began life thousands of years ago, and which have formed great beds of peat 20 feet thick. There are about 3,000 species of mosses, divided into four orders. "Irish moss" is not a moss, but a seaweed, and "Iceland moss" is a lichen.

Moths, insects closely related to butterflies, but flying mostly at night. They usually have thread-like or feathery antennæ, and hold their wings nearly flat when resting; butterflies usually hold theirs erect. Like butterflies, their wings are covered with scales, and, therefore, they belong to the order *Lepidoptera*. There is a general impression, that moths are smaller and more somber than butterflies, and while this is true in reference to many moths and "millers," nevertheless, some of the largest and most beautiful of the Lepidoptera are moths. The Cecropia and Promethea moths are large and beautiful forms with bright colors and eye-spots on their wings. The Luna moth, of a pale green color, with eye-like spots having a transparent center on each wing, is especially attractive. The hawk moths, coming from larvæ like the tomato worm, are examples of large moths. Among the best known moths

are the silkworms — whose cocoons supply most of the silk of commerce. Some of the smaller forms are very destructive to furs, woolen cloth, and other fabrics. The larvæ of others are destructive to crops and trees. The armyworm, cottonworm, and tent caterpillars are larvæ of moths. See ARMYWORM, COTTONWORM, CATERPILLAR.

Mo'tion, Laws of. By these reference is generally had to the three great generalizations in which Newton described the effect of forces upon bodies. See DYNAMICS where these laws are stated. See also *Newton's Laws of Motion*, by Professor P. G. Tait (London 1899), for an extraordinarily clear, brief, and elegant discussion of this subject.

Mot'ley, John Lothrop, an American historical writer, was born at Dorchester (now part of the city of Boston), Mass., April 15, 1814. As a boy he had Bancroft for a teacher. His higher education he obtained at Harvard college and in German universities, where he made a friend of Bismarck. His first great work, the *History of the Dutch Republic*, was the result of nearly ten years' labor, much of the time being spent in Berlin, Dresden, and The Hague, in searching for materials. It was translated into Dutch, French, German, and Russian, and established his fame. It was published in three volumes in 1856. His room is shown to visitors in the queen's palace at The Hague, where he worked by royal invitation. *The History of the United Netherlands* followed, the first two volumes being published in 1860, and the last two in 1868. His last work was the *Life and Death of John Barneveldt*, which is still another contribution to the history of Holland. His plan of historical writing embraced a *History of the Thirty Years' War*, which was not finished. He was also a contributor to the *Atlantic Monthly*, and his letters to the *London Times*, during the Civil war, were effective in giving to the English people an understanding of the real question involved. He was United States minister to Austria from 1861 to 1867, and in 1869–70 minister to England. He died at the home of his daughter, in Dorsetshire, England, May 29, 1877. See *Memoir*, by Oliver Wendell Holmes; *Letters*, edited by George William Curtis.

Mo'tor is the name applied to any mechanical device by means of which energy is converted into motion. A windmill, used for driving a wheel or working a pump, is sometimes called an aeromotor. A machine by which the pressure of water in city mains is made to operate mechanical devices is usually called a water motor. Motors for the use of compressed air have of late years been much used, especially for the propulsion of street cars. But the name is now most frequently applied to devices for the conversion of static into dynamic electricity. Motors operated by electricity have been devised to propel everything from a bicycle to a locomotive. Electric power is sometimes conveyed to the motor from a waterfall, and sometimes from a storage battery. In any simple electric motor one finds a field magnet consisting of various coils of insulated wire on soft iron cores. These are connected by a yoke; and lines of force are developed around the pole pieces when a current of electricity is run through the coils. Within these lines of force rotates the armature. Of late, through improved devices, power is conveyed long distances, as from Niagara Falls to Buffalo; and power is conveyed to thousands of motors which operate innumerable mechanisms at a distance from the source. The discovery that natural forces can be made to store electric forces which may be in turn reconverted into dynamic electricity at the other end of the wire by means of an electric motor, is one of the greatest discoveries of the 19th century.

Mo'tor Or'gan (in plants), a term applied to a portion of the leafstalk (petiole) which is sensitive to certain stimuli (see IRRITABILITY) and has a special structure enabling it to curve easily. Motor organs are most perfect in the bean family and oxalis family, but exist also in some spurges (*Euphorbia*), the common mallow (*Malva rotundifolia*), and velvet leaf (*Abutilon Avicennæ*). To the eye the motor organ is usually of a different color from the rest of the leafstalk, and either larger or smaller. If the leafstalk is long the motor organ will be at the base; if short the whole stalk may be a motor organ. In compound leaves there may be motor organs at main and secondary (and even at tertiary) petioles. In contrast with the rest of the petiole the woody parts of the motor organs are gathered near the center, and the whole of the surrounding tissue is made of thin-walled cells. When their turgor (which see) increases on one side and decreases on the other the motor organ becomes curved carrying the leaves into a new position. See article on MOVEMENTS.

Mott, Mrs. Lucretia Coffin, an American quakeress, was born at Nantucket, Mass., Jan. 3, 1793. She became a preacher and traveled through New England, Pennsylvania, Maryland, and Virginia, preaching the Quaker doctrines and opposing intemperance and slavery. She was active in organizing the anti-slavery society at Philadelphia in 1833, and proceeded as a delegate to the world's anti-slavery convention at London in 1840. She was also prominent in woman's rights assemblies. She died Nov. 11, 1880.

Mould (among plants). See PHYSOMYCETES.

Mound Build'ers, the name given to the race whose works, known as earthworks, are found in America, largely in the shape of mounds. There are many theories in regard to them, some believing them to be the same

as the American Indians, the ancestors either of the more civilized Indians found in the southern states, or of the Aztecs in Mexico, while others consider them to have been a superior race, of whom nothing is known, except these curious remains. From the contents of the mounds they (their builders) seem to have been passing from the stone age to the metal, familiar with copper, but possessing chiefly weapons and tools of stone. Some of the mounds seem to have been used as burial places, and others as temples. They are found in the Mississippi valley, and in other parts of North America, but most extensively in Ohio, Indiana, Illinois, and Missouri. They are mounds varying from 6 to 25 feet in height, though some of the temple mounds reach higher; one in Illinois is 90 feet high, and measures 700 by 500 feet at the base. They usually have a ditch around them, and are often in an inclosure, with low earth walls and connecting passages, as one at Newark, O., which covers more than two square miles, and has about 12 miles of embankments from 2 to 20 feet in height, and another at Marietta, O., covering a large square, with double walls inclosing a passage to the river. When used as burial places the mounds rarely contain more than one skeleton. There are also curious figures of animals; one in the form of a serpent, 1,000 feet long and about five feet high, was discovered in Adams county, O. The period when the mounds were built is variously estimated. The Indians found in North America, when settled by Europeans, were very much behind the mound builders in their arts of living, judging from the remains found. The large trees growing on the mounds are another indication of their age; and the fact that they are never built on the lowest formed river terraces, is thought to be another proof of their great age, which is estimated at from 1,800 to 2,000 years. See *Ancient Monuments of the Mississippi Valley*, by Squier and Davis; *Antiquities of Ohio*, by Shepherd; *Antiquities of Tennessee*, by Thurston.

Mount Car'mel Pa., a borough in Northumberland county, in eastern central Pennsylvania, 28 miles east of Sunbury. It lies in the anthracite coal region, on the Lehigh Valley and the Philadelphia and Reading railroads. The town has gained about 5,000 inhabitants in the past decade, its present population being 13,179.

Mount Holyoke (*hōl'yōk*) **College**, a college for women at South Hadley, Mass., founded by Mary Lyon. It was chartered in 1836 as Mount Holyoke seminary, and was long maintained under this name as a seminary of high grade. In 1893, it was chartered as Mount Holyoke college, and the institution was placed in respect to educational facilities and requirements on a standing with the colleges for young men. It has a faculty of 60, and the students number 550.

Mount Ver'non, the home and burial place of George Washington, is situated in Virginia, on the Potomac river, fifteen miles below Washington. The estate originally included several thousand acres. The house is of wood, two stories high and 96 feet long, and was built by Lawrence Washington, an elder brother of George Washington, and named in honor of Admiral Vernon, under whom he had served in the West Indies. Washington improved both the house and the grounds. The library and Washington's bedroom are kept as they were when in use by him. He left the estate to a nephew, who sold the house and 200 acres of land, to the Ladies' Mount Vernon association, a society organized to care for it and keep it as a national possession.

Mount Ver'non, N. Y., a flourishing city in Westchester county, southeastern New York, on the Bronx river, fourteen miles north of New York city. It is served by the New York Central and Hudson River, and by the New York, New Haven, and Hartford railroads. The town is prettily situated, and commands a fine view of Long Island sound. It now includes part of the town of Eastchester and the suburb of Chester Hill, and has almost doubled its population in the past decade. It is largely occupied by New York business men as a place of residence. There are many fine churches, schools, libraries, banks, and an opera house. It has a few industries, including manufactures of pens, rubber, jewelry, carriages, etc. Population 20,346.

Mouse, a small gnawing animal closely related to the rat. The common house mouse, originally an inhabitant of Asia, has spread until it is now found round the world. It is so common that its appearance and habits are well known, but it is not so generally known that, besides squeaking, the animal is a musical singer. Its song is rythmical, in a high key, and, as one observer says, "something like a weak-voiced canary bird." Besides the house mice there are various kinds of field and meadow mice. The harvest mouse of Europe is very small, being between two and one-half and three inches long. It lives among grasses and in cornfields, where it builds a globular nest about the size of a cricket ball, in which its young are reared. The American field mouse differs from the house mouse in having a blunt nose, short limbs and tail. When abundant they are great pests to farmers. In 1890, the wheat crop in South Australia was almost completely ruined by field mice. The white-footed mouse, or deer mouse, known by its snow white feet, is common in the United States, especially in the west.

Move'ments (in plants). Movement from place to place is possible only to the simpler plants and those living in water or on wet surfaces. To accomplish it, the protoplasm is

extended either into one or more slender threads, called cilia, which bend quickly and act somewhat as oars; or into broad blunt protrusions by means of which the cells creep. (The method of some movements is still unknown.) Movements of larger plants are due to bending. This may be done by unequal growth on different sides or by unequal turgor (which see) on the opposite sides. Motor organs (which see) are regions of the leafstalk specially arranged to permit curvature by the latter method. Movements are usually executed in response to some stimulus, though some seem to be spontaneous. See also IRRITABILITY, CHEMOTAXIS, CHEMOTROPISM, GEOTROPISM, HELIOTROPISM, HYDROTROPISM, PHOTOTAXIS, RHEOTROPISM, and THERMOTROPISM.

Mozambique (*mō-zam-bēk'*), the name given to the northern possessions of Portugal on the eastern coast of Africa. They include Mozambique, Zambezia, and Lourenço Marques, and extend from Cape Delgado to Delagoa bay, 1,300 miles. The Zambezi is the principal river, and forms the southern boundary of Mozambique proper, its inland border extending to Lake Nyassa. The coast is low and swampy, but the interior has well-wooded plains, with valuable timber. The soil is fertile and produces corn, rice, cotton, cocoanut, and india rubber. The country is rich in minerals, but mining has not been extensive. The capital is Mozambique, built on a coral island near the mainland. The Mozambique company administers, besides Mozambique, the Manica and Sofala region.

Mozambique Channel lies between the island of Madagascar and the east coast of Africa. It is about 400 miles wide, and 1,000 miles long.

Mozart (*mo-zart'*), **Wolf'gang Amade'us Chrysos'tom,** the great musician, was born at Salzburg, Germany, Jan. 27, 1756. When only six years old, his father took him and his sister on a musical tour through Europe. In Bologna, then the great centre of music in Italy, the Philharmonic society elected him for membership when only fifteen, in spite of its rule that no one under twenty should be admitted. The Easter music in the Sistine chapel was jealously guarded, and no copy allowed to be made, but young Mozart, hearing it once, wrote it out from memory. In 1781, he lost his position in the court of the archbishop, with whom he had gone to Vienna. He produced soon after two operas, one of them, *The Marriage of Figaro*, which created a furore, and he was commissioned to write an opera for the theatre in Prague. The summer-house where, and the little stone table on which, he wrote this opera, *Don Giovanni*, are still shown in the gardens at Prague. The great success of this work made it impossible for the court to overlook his merits longer, and he received an appointment by the emperor, with a small salary, his duty being to supply the dance-music at the imperial balls. He struggled with debt, a false loyalty preventing him from leaving the service of the emperor when offered a better position in Prussia. A friend, a theatre manager, in financial difficulties, induced Mozart to come to his aid with a new opera, and he began in March, 1791, his *Magic Flute*. It was produced in September, and made the fortune of the lucky manager. While at work on this opera, a stranger visited him and commissioned him to write a requiem mass, to be finished in a month. He imagined there was something mysterious about the order, and said he was writing it for himself. He was really dying, and on Dec. 4, 1791, when a few friends met to rehearse the part of the work that was finished, he was unequal to the effort, though even when unconscious seeming to be occupied with his work. He died that night at Vienna, and was buried in the churchyard. When his wife tried to find the grave a few days after, no one could tell her where it was. Many years after his death, Vienna honored him with a monument. Mozart wrote 624 compositions. In opera and symphony he is second to none. His three great operas, *Don Giovanni*, the *Magic Flute*, and *Figaro*, still hold their place on the stage, and three of his forty-one symphonies will always be admired as long as music exists. See *Life*, by Otto John, translated by Townsend.

Mudfishes, a small but important group of fishes that possess lungs as well as gills. They are also called lung-fishes, and form a natural order — the *Dipnoi* or double breathers. In having lungs they approach the class of amphibia just above the fishes. They are descended from a very ancient stock of fishes, representatives of which are found in the mesozoic rocks. There are only three varieties now living: the ceratodus, of Queensland, Australia; the protopterus, of the rivers of tropical Africa; and the lepidosiren, of the Amazon and its tributaries. They are all fresh-water fish of an eel-like form, and attain a length of three to six feet. Ceratodus is the largest, reaching a weight of twenty pounds. Its flesh is highly esteemed as food. It feeds on plants and the insects found upon the leaves. Protopterus is smaller. It feeds on insects, frogs, and smaller fishes. At the approach of the dry season, it burrows in the mud, and forms around itself a capsule of earth. This is lined internally with a moist slime secreted by the glands in the skin. Within this case the fish lies in a dormant condition, feeding upon fatty material stored up mainly in the tail. These capsules of earth have been dug out, and the living fish safely transported to Europe and the United States. They are revived by immersion in the water. The lepidosiren is not so well known as the other two forms.

Muhlenberg (*mu'len-berg*), **William Augustus,** an American divine, noted as a hymn-writer, was born at Philadelphia, Sept. 16, 1796. He graduated at the university of Pennsylvania in 1814, and became an Episcopal clergyman. Soon after becoming rector of a New York church, he set about getting funds to found St. Luke's hospital, and it was due to his untiring efforts that the present great hospital on Fifth avenue, New York, was built, Dr. Muhlenberg becoming its superintendent. He was the author of the well-known hymn, *I Would Not Live Alway*, and edited several collections of church music. He died at New York, April 8, 1877.

Mulat'to. See NEGRO.

Mul'berry, species of Morus, a genus which belongs to a family closely related to the nettle family. About 100 species of mulberry have been described, all of which are trees of the temperate regions of the northern hemisphere. In the United States, the mulberry is known almost entirely as a fruit-bearing tree, although it is not cultivated in any general way. In the Old World, mulberries are grown as food for silk worms, as well as for the fruit. The silk worm mulberry is *M. alba*, and the chief fruit-producing mulberry is *M. nigra*. *M. alba* is a native of China, and has been cultivated from the earliest times in connection with the silk-worm industry. The fruit is small and white or violet. The black mulberry is a native of Asia, and is cultivated chiefly in the Old World for its fruit, which is large and fleshy, mostly dark colored. The native red mulberry of the United States is *M. rubra*, which grows mostly in rich soils and bottom lands.

Mulhausen (*mül-how'zen*), a city of Alsace-Lorraine, Germany, on the Ill and the Rhône, and the Rhine canal, 20 miles northwest of Basel. Its cotton manufactories employ 75,000 hands, and it has printing and dye works for cotton, linen, calico, wool, and silk fabrics, chemical, and iron-works. The city was founded before A. D. 717, and became a free imperial city in 1273. It became a part of France in 1798, and after 1829 began to be a noted manufacturing center. Its arrangements for housing and caring for the working-classes are remarkably good. Since the war of 1870–71, Mülhausen has belonged to the German empire. Population 82,986.

Mullein (*mül'lin*), the name of species of the genus Verbascum, which belongs to the figwort family. The genus contains about 125 species, all of them natives of the eastern hemisphere. About five species have become naturalized in North America, the most conspicuous of which is the common mullein (*V. thapsus*), an erect, stout, simple plant, which is densely woolly all over, and is exceedingly common in fields and waste places. It is a native of Europe and Asia, and is said to have received in England no less than 40 common names. The next best-known naturalized species is the moth mullein (*V. blattaria*), with a slender, merely pubescent stem, and a loose cluster of yellow or white flowers with brown marks.

Muller (*mül'ler*), **Johan'nes,** a distinguished German physiologist, was born at Coblentz in 1801, and died at Berlin in 1858. He became professor of physiology at Bonn, in 1826, and at the university of Berlin in 1833. He is a monumental figure in the history of physiology. By wide observation and experiment he founded comparative physiology. He was the trainer of some of the greatest physiologists, as Ludwig, Du Bois-Reymond, Helmholtz, and others. In his work he recognized the close connection between physiology and psychology, and thereby made a beginning in physiological psychology. His work was so remarkable that he gained for himself the title of the "greatest physiologist of modern times." He was myriad-minded, and later in life gave his attention to zoology, winning in that field the title of the "greatest morphologist of modern times." His handbook of physiology (1833) is unsurpassed in the method of handling the subject. His anatomy of some of the lower fishes (myxinoids) is remarkable for accuracy and for his appreciation of the meaning of his discoveries.

Mul'let, a food fish found in tropical and temperate waters. On the American coast they range as far north as Cape Cod. The mullet family contains mostly sea-fishes, but the representatives ascend streams, and a few forms are permanent residents of fresh water. They feed at the bottom, taking quantities of mud into their mouths, and sifting out the small particles of animal and vegetable matter. The name mullet is also given to a very common sucker of inland streams in the United States. These fish grow to a length of two feet. Their lower fins are of an orange-red color, and they are often called red-horse.

Mu'lock, Miss. See CRAIK.

Mul'ready, William, an Irish landscape and figure painter, was born at Ennis, County Clare, Ireland, April 1, 1786. When a boy he went with his parents to London, and when fifteen began to study at the Royal academy. His genre paintings are the best, such as *Dogs of Two Minds*, *The Barber's Shop*, *Idle Boys*, in his earlier years; and in middle life *First Love*, *The Truant*, and *Seven Ages*. He also worked unweariedly at portrait-painting and at illustrations for children's books, while his illustrations of the *Vicar of Wakefield* are well known. He was careful in drawing and rich in coloring. Mulready died in London, July 7, 1863. See Stephens' *Memorials of Mulready*.

Mum'my, the name given to embalmed bodies. Embalming, so named from the

balm or balsam often used, is the art of preserving the body after death, and was invented by the early Egyptians. This art seems to have arisen from the belief that the preservation of the body was necessary for the return of the soul to the human form after being separated from it for three or ten thousand years. The question of health may also have influenced the Egyptians; and the story of the god Osiris, whose body, destroyed by Typhon, was found by Isis and embalmed by his son Anubis, made it a religious rite. The art appears as old as 4000 B. C. at least, for the bodies of Cheops and others of the age of the 4th dynasty were mummied. One of the earliest embalmments of which we have a record is that of the patriarch Jacob, and the body of Joseph was thus prepared and carried out of Egypt. The process is told by the Greek historians, Herodotus and Diodorus. A scribe marked with a reed pen a line on the left side beneath the ribs, down which line the district ripper, a low-class officer, made a deep cut with a stone knife; he was then pelted with stones and chased with curses. The salter next removed the entrails and lungs, except the heart and kidneys, while a companion took out the brain through the nose. The body was then ready for the salts and spices necessary for its preservation, the quality of which depended upon the sum to be paid. In the case of the wealthy, peculiar drugs were passed through the nostrils into the cavities of the skull; the body cavity was washed with palm wine, filled with myrrh, cassia, and other substances, and the cut sewed up. The mummy was then kept in natron (niter) for seventy days, then washed, bandaged in rolls of linen held together by gums, and set upright in a wooden coffin against the walls of the house or tomb. This process cost a silver talent, worth in our money about $3,725. Using cedar oil was a cheaper method and cost a mina, worth about $1,215.

The poorer classes washed the corpse in myrrh, and salted it for seventy days. When thus prepared and covered with a picture of the dead, and clothed as a laborer in the world to come, the mummy was placed in a costly coffin ready for burial, but often kept sometime unburied — often at home — and even brought at feasts and festivals to remind the guests of the shortness of life. All classes, even criminals, were embalmed; but various other methods were used. Some mummies are found merely dried in the sand, others salted by natron, or soaked in bitumen, often with the skin partly gilded and the fingers cased in silver. So successful were some of these processes, that after 2,000 or 3,000 years the soles of the feet are still elastic and soft to the touch. The sacred animals were also mummied. Probably between 4000 B. C. and 700 A. D., when the preservative process practically ceased, as many as 730,000,000 bodies were embalmed in Egypt, of which many millions are yet hidden. Important finds are made from time to time; as in 1881, when over 30 mummies of potentates, including that of Rameses II., were found together at Deir-el-Bahari. Mummies were used in the 15th and 16th centuries of our era for drugs, and as nostrums against diseases.

Other less successful means of embalming were used by early nations. The Persians employed wax; the Assyrians, honey; the Jews, aloes and spices; Alexander the Great was preserved in wax and honey, and some Roman bodies have been found thus embalmed. The Guanches, the early people of the Canary islands, used a process like the Egyptians; and dried bodies preserved by the air have been found in Sicily, France, England, and America, especially in Central America and Peru. In Burma, the bodies of priests are preserved with spices and honey, and are coated with wax and goldleaf. In Europe, Ruysch and William Hunter put oils into the main arteries; and a new means of embalming was found when Chaussier discovered the preservative power of corrosive sublimate, by which animal matter becomes rigid, hard, and grayish. Arsenic, chloride of zinc, and other substances are now used where bodies are to be kept only for a short time. The latest method generally used in the United States is by passing a fluid into the arteries. See Pettigrew's *History of Mummies*.

Munchhausen (*munk'how-zen* or *mŭnchaw'sen*), **Karl Friedrich Hieronymus, Baron von,** was born May 11, 1720, at Bodenwerder, Hanover, of an old noble family. He served as a cavalry officer in Russian campaigns against the Turks, and died at his birthplace, Feb. 22, 1797. A collection of his marvelous stories, or stories attributed to him, was first published in English under the title, *Baron Münchhausen's Narrative of His Marvelous Travels and Campaigns in Russia*, in 1785. The stories were gathered by Rudolf Erich Raspe, a countryman of the baron's living in England. The book at once became popular and has remained so ever since. Münchhausen's name has become proverbial for wild and impossible exploits and adventures.

Mun'cie, Ind., a fast-growing city in Delaware county, on the White river, in eastern central Indiana, a region producing freely of natural gas, which is largely utilized as fuel by its industries. It is situated 54 miles northeast of Indianapolis. It is served by the Cleveland, Cincinnati, Chicago, and St. Louis, by the Lake Erie and Western, and by the Ft. Wayne, Cincinnati, and St. Louis railroads. Its manufactures embrace pulp and paper works; a flour-bagging factory; glass, nail, and iron works, etc. It has a number of schools, churches, banks, and a good public library. Population 20,942.

Munich (*mū'nik*), the capital of Bavaria, lies on a flat and barren plain, 1,700 feet

above the sea, chiefly on the west bank of the Isar, 272 miles west of Vienna. Seven bridges span the river to the suburbs on the east bank. Munich is one of the handsomest cities of Germany, and perhaps the richest in treasures of art, while itself famous for its school of painting. Within the last two generations it has been decorated with buildings of almost every style of architecture, many of them ornamented with frescoes and sculpture; wide and handsome streets have been built; and the squares and gardens have been adorned with statues and other monuments. Among the main buildings are the Glyptothek, with its fine collection of ancient and modern sculptures; the Old Pinakothek, containing paintings by the old masters, besides thousands of engravings and drawings, and a priceless collection of antique vases; the New Pinakothek, filled with modern paintings; the royal and national library; and the Bavarian national museum. The New Palace includes an older palace and chapel, the Königsbau, in the style of the Pitti Palace at Florence, with Schnorr's frescoes of the Nibelungenlied, and the richly adorned banqueting hall building. Among the gates of Munich the most beautiful are the Gate of Victory, the old Isar gate, and the Propylæa. St. Peter's is the oldest church, built in 1294. The huge brick church of Our Lady is remarkable for its two unfinished towers. St. Michael's contains a monument by Thorwaldsen to Eugene Beauharnais. In the Louis church is Cornelius' fresco of the *Last Judgment*. The university has 202 professors and teachers, and over 4,391 students. The main parks are the Court Garden, the English Garden, and Gasteig promenades. Munich is noted for its stained-glass works, iron, brass, and bell foundries, lithographing and engraving works, and factories of optical and mathematical instruments. There are also very large breweries of Bavarian beer, which produce yearly over 50,000,000 gallons. The chief trade is in grain, and in objects of art.

The name Munich comes from the Monks who owned the site. It really began as a town in 1158, when Henry the Lion established there a mint and a salt exchange. It was fortified in the 13th century. In 1327, the old town was nearly destroyed by fire, and was rebuilt by the Emperor Louis the Bavarian. The true history of modern Munich is the account of its growth as an art center in the 19th century. Population 499,959. See Mrs. Howitt-Watts' *Art Student in Munich*.

Munkacsy, Mihaly (*mŏn-kăch'ē*), a Hungarian painter, was born at Munkács, Hungary, Oct. 10, 1846. His real name was Michael Lieb; and his family, before the revolution of 1848, was one of modest affluence. The father having lost both property and life in the uprisings of that year, the son was apprenticed to a cabinet maker. He was encouraged in his first artistic attempts by Samosy, an artist of some reputation; and, having reached the Vienna academy, he was enabled to study to some purpose under Adam (Franz). He went to Düsseldorf in 1867, and painted there *The Last Day of a Condemned Man*, which at once won him fame. He removed to Paris in 1870, was married in 1874, and built himself an elegant mansion in that city. His best known works in America are *Milton dictating to His Daughters*, and *Christ before Pilate*. He visited the United States in 1886, and painted several portraits of prominent people in New York. His earlier works show the somber effects of his laborious life; his middle period something of the lightness of the Parisian environment; but his greatest fame was won in the third period of his development from the treatment of historic and sacred themes. He died near Bonn, May 1, 1900.

Murat (*mū-rä'*), **Joachim,** king of Naples, was the son of an innkeeper, near Cahors, in France, and was born March 25, 1771. He was at first intended for the priesthood, but the outbreak of the revolution sent him to the army, where he soon rose to the rank of colonel. Attaching himself closely to Napoleon, he served under him in Italy and in Egypt, achieving distinction in many battles. He was made a general of division in 1799, and greatly helped Napoleon on the critical 18th Brumaire by dispersing the council of five hundred at St. Cloud. Napoleon now intrusted him with the command of the consular guard, and gave him his youngest sister, Caroline, in marriage. Murat held his usual post, the command of the cavalry at Marengo, where he covered himself with glory, and in 1801 was named governor of the Cisalpine Republic. When Napoleon became emperor, he continued to command his cavalry, and helped greatly to win the victories of Austerlitz, Jena, Eylau, etc. In 1806, the newly made duchy of Berg was given him, and on Aug. 1, 1808, he was proclaimed king of the two Sicilies, under the name of Joachim I. Napoleon. He took possession of Naples, but failed to secure control of Sicily. He governed well and won the hearts of his subjects. In the Russian campaign he commanded the cavalry, and the army after Napoleon left it. After crushing the Austrians at Dresden, in 1813, and helping to fight the battle of Leipsic, he made a treaty with Austria, and a truce with the British admiral, but as soon as he heard of Napoleon's return from Elba, he began a hasty war against Austria. He was twice defeated at Ferrara and Tolentino, and with a few horsemen made his way to Naples. Here he found the country in a state of insurrection, and at once proceeded to France. After the overthrow of his chief, he took refuge in Corsica. From here he went with a few followers to the coast of Calabria, and proclaimed himself king, but was soon taken prisoner, tried by court-martial, and shot at Pizzo, Italy, Oct. 13, 1815. Of his two sons,

the elder, Achille Napoleon, went to America, married a niece of Washington, and settled in Florida; the younger, Lucien Charles Napoleon, became a French senator and ambassador under Napoleon III. See Macirone's *Fall and Death of Murat.*

Muravieff (*mō-rä-vyĕf'*), Count **Michael,** was born in 1845, and died at St. Petersburg, June 21, 1900. He was descended from a long line of distinguished ancestors; educated at Poltava and Heidelberg; attached to the Russian embassy at Berlin when under twenty years of age, and in diplomatic service until he became minister of foreign affairs at St. Petersburg in 1897. He had resided as the representative of the czar at Stockholm, The Hague, Paris, and Copenhagen, as well as in Germany. He was passionately devoted to the interests of the czar, and was in consequence distrusted by foreign powers. He died soon after he had reached the summit of his power.

Murchison (*mur'ki-son*), Sir **Roderick Impey,** Scottish geologist and geographer, was born at Tarradale, Ross-shire, Scotland, Feb. 19, 1792. He studied at the Military college, Great Marlow, and entered the army at an early age. He served as an officer in Spain and Portugal, but left the army in 1816. He then studied and traveled in various parts of the globe. He found the same rock strata underlying the red sandstone of mountainous regions of Norway and Sweden, in the distant provinces of the Russian empire, and also in America. This gave him the clew to the discovery of the Silurian system, and a wide reputation as a geologist. He explored several parts of Germany, Poland, and the Carpathians; and in 1840–45 carried out a geological survey of the Russian empire. Struck with the similarity between the rocks of the Ural mountains and the Australian chain, Murchison, in 1844, first foretold the discovery of gold in Australia. Perhaps no man of his time did more to encourage geographical science, and kindle the spirit of adventure among those engaged both in arctic exploration and in African discovery. He was a member of many scientific societies, was knighted in 1846, became a baronet in 1863, and in 1855 was made director of the Royal School of Mines. His chief works are, *The Silurian System,* and *The Geology of Russia in Europe and the Ural Mountains.* Murchison died Oct. 22, 1871. See his *Life,* by Professor Archibald Geikie.

Murcia (*mur'shi-ä*), an old city of Spain, on the Segura river. It is an old-fashioned Moorish place, surrounded by gardens of mulberry, orange, fig, palm, and other fruit trees. The main buildings are the bishop's palace and the cathedral, begun in 1353. Silks, saltpeter, gunpowder, soda, musical instruments, and glass are manufactured here. Fruit-growing, the preparation of olive-oil, and esparto-weaving also flourish. Alfonso X. took the city from the Moors in 1263. An earthquake almost destroyed it in 1829, and it was captured by Spanish rebels in 1843. Population 108,408.

Mur'doch, James Edward, an American actor, was born at Philadelphia, June 25, 1811. He first appeared on the stage in his native city. In 1838, he supported Ellen Tree in leading characters at New York. He left the stage in 1842 to teach elocution. He also lectured on Shakespeare. In 1845, he again became an actor, appearing at New York as "Hamlet" and afterward toured in Canada, California, and England. During the Civil war he gave readings throughout the North in aid of the sanitary commission, devoted himself to the care of sick and wounded soldiers, and served for a while on General Rousseau's staff. Together with William Russell he published *Orthophony, or Culture of the Voice.* After the war, Mr. Murdoch lived at Philadelphia, and died at Cincinnati, May 19, 1893.

Mur'dock, William, the inventor of gas used as a light, was born Aug. 21, 1754, near Auchinleck, Ayrshire, Scotland. He worked under his father, who was a millwright and miller, till he was twenty-three. He then entered the employment of a Birmingham house and showed such marked ability that he was sent to Cornwall to superintend the setting up of mining engines there. In 1784, he built the model of a high-pressure engine to run on wheels. His work at Cornwall was hard, yet up to his forty-fourth year his wages were not more than $5 a week. Murdock's inventive brain was never idle; he introduced labor-saving machinery of various kinds, and an oscillating engine of a pattern still in use. His investigations in the distillation of coal gas began in 1792, when he lighted his offices and cottages by this means. But he reaped little profit from this useful invention. Murdock died at Birmingham, England, Nov. 15, 1839.

Mur'free, Mary Noailles, whose fame as a writer was gained under the name of "Charles Egbert Craddock," was born near Murfreesborough, Tenn., at a point where some of the hardest fighting occurred in the battle of Stone River. The fortunes of her father, a successful lawyer, were wrecked by the war. The desire to write came to her naturally, as both her father and brother had written for the magazines and reviews. Her first story, which appeared in the *Atlantic Monthly,* was *The Dancin' Party.* "Egbert Craddock" was the name of the hero of her second short story, which was half written when she was about to mail the first part to the publishers. Being at a loss for a pseudonym, she stole that of her hero, with the prefix "Charles." The buildings at Miss Murfree's birthplace, the scenes of parts of *Where the Battle was Fought,* were riddled by shot and shell at the battle of Stone River. This is a novel of

great and picturesque power, though *The Prophet of the Great Smoky Mountains* is held to be her best work. *In the Tennessee Mountains* is a collection of eight stories. *Down the Ravine* professes to be a young people's story, but no one is too old to be entranced by its sketches of scenery in the Cumberland mountains and the picture of the "powerful peart" little sister Tennessee. Miss Murfree puts her heart into her work. Her later books include: *The Juggler*, *The Phantoms of the Footbridge*, and *The Mystery of Witch-face Mountain*. In a private letter she says that "nothing of value can be done without the most zealous work in aid of whatever natural gifts one may possess."

Mur'freesbor'ough, from 1819 to 1826 the capital of Tennessee, is 33 miles southeast of Nashville, and has several mills and factories. Close by, the bloody battle of Stone River was fought, Dec. 31, 1862, and Jan. 2, 1863, between Generals Rosecrans and Bragg. The Confederate army was forced to retreat. The losses on both sides, in killed and wounded, were nearly equal — Federals, 9,511; Confederates, 9,236. Population 3,999.

Murillo (*mū-rilʹō*), **Bartolome Esteban,** a famous Spanish painter, was born of poor parents at Seville, Spain, and baptized Jan. 1, 1618. He had a little schooling, and was then placed with a relative who was an artist, to study painting. He saved a little money from the sale of his first rough and stiff religious pictures to the friars of Seville, and went to Madrid at the age of twenty-four. He was kindly noticed by his celebrated townsman Velasquez, and through his influence was enabled to study the great Italian and Flemish masters in the royal collections of paintings. Velasquez wished him to go to Rome, and offered him letters from the king, but Murillo determined to go back to Seville, where he settled in 1645. Here he painted eleven large and remarkable pictures for the convent of San Francisco. At once he won fame; had more orders than he could well fill, and was acknowledged as the head of the school there. In 1648, Murillo married a woman of fortune, and his house became a center of taste and fashion. About this time he passed from his first or "cold" style — dark with decided outlines — to his second or "warm" style, in which the drawing is softer and the color better. Of the second style, good examples are, *St. Leander*, the *Nativity of the Virgin*, and *St. Anthony of Padua*. In 1656, he was at work on four large pictures in the form of a half circle, which are the first examples of his third or "vaporous" style, the outlines vanishing in a misty blending of light and shade. In 1660, he founded the academy of Seville; and was its president for a year. After this, appeared Murillo's most brilliant paintings. Of the eleven pictures painted between 1661 and 1674, for the almshouse of San Jorge, eight are held to be his masterpieces. Among them are *Moses striking the Rock*, *Abraham and the Angels*, *The Miracle of the Loaves and Fishes*, *St. Peter released from Prison*, and *St. Elizabeth*. His famous picture, *The Conception*, now in the Louvre at Paris, was sold in 1852 for $120,000. In 1681, he went to Cadiz, and while there fell from a scaffold when painting an altar-piece in the church of the Capuchins. He went back to Seville and died from his injuries, April 3, 1682. Murillo's pictures are in two groups — scenes from low life, gypsies and beggar children (mostly painted in early life), and Scripture and religious works. His pictures show great technical skill, truth to nature and sentiment, while as a painter of the texture of human flesh he has never been equaled. See Miss E. E. Minor's *Murillo*, and C. B. Curtis' *Velasquez and Murillo*.

MURILLO.

Mur'ray, Lind'ley, an American grammarian, was born at Swatara, Lancaster county, Pa., April 27, 1745. He was educated at Philadelphia at a school conducted by the Friends. His father having removed to New York, he was placed in a counting room there; but he ran away in order to pursue his studies at school in another state. He was later admitted to the bar, but during the Revolution was engaged in business in New York, where he rapidly acquired a fortune. In 1784, he retired from mercantile life, going to England where he purchased an estate and devoted himself to literary pursuits. His *English Grammar*, issued in 1795, was received with enthusiasm, and his *English Reader* was used upon both sides of the Atlantic. These books retained their unbounded popularity in schools for fifty years or more. He died at Holdgate, England, Feb. 16, 1826.

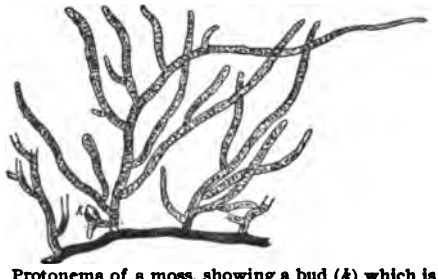
Mur'ray River, the chief river of Australia. It rises in the Australian Alps, flows northwest along the frontiers of New South Wales and Victoria, and in South Australia passes southward through the shallow Lake Alexandrina toward the sea at Encounter bay, a distance of 1,120 miles. It is navigable for small steamers to Albury, 190 miles northeast of Melbourne, but its mouth cannot be entered by ships of any size. Its main branches, the Lachlan, Murrumbidgee, and Darling, are themselves large rivers.

Muscat (*mus-katʹ*), capital of the independent state of Oman, or Muscat, in south-

eastern Arabia, stands in a narrow rocky cove that opens out into the Indian ocean on one side, and on the other is the outlet of a pass into the interior. It is surrounded by a wall and defended by forts on the rocky heights above. It has narrow, uncleanly streets, and is very hot in summer. Its position makes it of great importance for the trade between eastern Arabia, Persia, India, the west coast of Africa, and the Red Sea. Its chief exports are pearls and fish, in which the waters of the coast are very rich, together with salt, dates, drugs, dyestuff, and horses. Although a very old place, Muscat was small and unimportant until the Portuguese took possession of it in 1508. Under their rule, lasting 150 years, it became a flourishing trading town. It was afterward ruled by native princes, called imams. The Muscat imams also ruled Zanzibar and other places in Africa, but lost these territories in 1856. Population 40,000.

Muscatine (*mus-ka-tēn'*), **Ia.,** is situate on the west bank of the Mississippi, built mostly on rocky bluffs, where the river makes a great bend to the south, 211 miles by rail southwest of Chicago. It has a large trade by river and rail, and has extensive pearl button manufactories, employing over 2,000 people; also furniture factories, flour and lumber mills. It was founded in 1836, and became a city in 1853. Population 14,073.

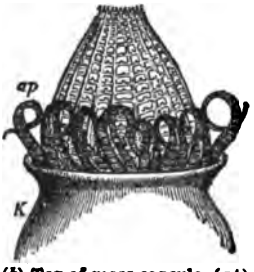
Musci (*mŭs'sī*), one of the two great groups of Bryophytes, commonly known as



Protonema of a moss, showing a bud (*k*) which is to give rise to the leafy branch.

mosses. The numerous species are adapted to all conditions, from submerged to very dry, and are most abundantly displayed in temperate and arctic regions. They have great powers of vegetative multiplication. In consequence of this they form the well-known thick carpets and masses, and the bog mosses often completely fill up bogs or small ponds and lakes with a dense growth which dies below and continues to grow above. These bogs are sometimes called "quaking bogs" or "mosses," and furnish very treacherous footing. When the ordinary spore of a moss germinates it produces at first a little green branching filamentous body resembling an alga, and called the "protonema." Upon this prostrate protonema buds arise, which develop into the erect leafy branches that represent the ordinary moss plant. These leafy branches bear the sex organs (antheridia and archegonia) usually at their summits. In the archegonium the egg is fertilized, forming the oospore. When the oospore germinates, it forms a body which grows downward into the leafy branch for anchorage, and also grows upward in the form of a stalk bearing a spore case. This anchored leafless body is the sporophyte, and is very commonly called the "moss fruit," although it is in no sense a fruit. The protonema and the leafy branches bearing sex organs constitute the gametophyte (See ALTERNATION OF GENERATIONS). This peculiar leafless sporophyte of the moss is usually distinguished from the leafy sporophyte of ferns and seed-plants by being called a "sporogonium." The most complex structure of mosses is the spore case or capsule. Usually perching upon the top of a young capsule is a loose conical cap or hood, known as the "calyptra." This calyptra is the enlarged and ruptured archegonium, which has been carried up by the development of the capsule. Removing the calyptra a small lid ("operculum") is discovered, which upon being removed reveals the rim of the urn-like capsule. This rim is frequently beset by numerous beautiful hair-like or tooth-like processes, which extend toward the center and form what is called the "peristome." These peristome teeth are of service in discharging the spores. Running through the midst of the capsule is a central axis of sterile tissue known as the "columella." Mosses are divided in two great groups: (1) sphagnum mosses, which are large and pallid bog mosses, found abundantly in marshy grounds, especially in temperate and arctic regions, and are conspicuous peat formers; (2) true mosses, which contain the great majority of the mosses, and are the representative Bryophytes, growing in all conditions of moisture from actual submergence in water to dry rocks.

Leafy branches of a moss bearing the stalked capsules (Sporophytes), the one to the left still retaining the hoodlike calyptra.



(*k*) Top of moss capsule, (*ap*) showing the peristome teeth.

JOHN M. COULTER.

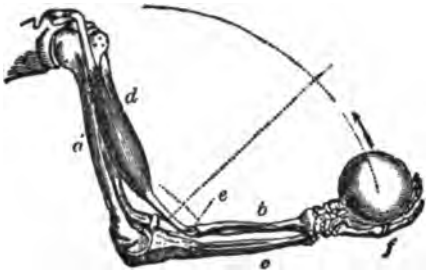
Muscle (*mus''l*), an animal tissue endowed with the power of contraction. It is the part called flesh or lean meat in the higher animals. Through its action motion and locomotion are accomplished in the animal king-

dom. Muscles have not been developed in the simple microscopic animals, like the amœba and its relatives, and, therefore, their movements are not dependent upon muscles, but upon the powers of the protoplasm of which they are composed. In that, however, lies the germ from which muscular tissue is developed. Muscles are composed of modified protoplasm, in which the power of contraction has been highly exalted, while the other qualities of protoplasm are undeveloped or held in check. Muscles first make their appearance in animals of the grade of hydra and the jellyfishes, but, in them, they are imperfectly developed. In all animals of a higher grade than jellyfish muscular tissue is fully developed. It arises in the middle germ layer (*mesoblast*). In its formation the cells elongate into fibers.

As an example of muscular tissue, take the muscles of the arm. These are bundles of flesh, which can be felt under the skin running lengthwise in the arm. Each muscle is covered with a smooth shining membrane, and is made up of a number of bundles also covered with a thin membrane. These bundles are further subdivided into smaller ones, and the microscope shows that these are made of thread-like fibers lying side by side. All are surrounded by sheaths and united together. The microscopic fibers are crossed by stripes, and this kind is called *striated* muscular tissue. It is the kind usually controlled by the will and is, therefore, called voluntary. There is another variety of muscular tissue found in the walls of the alimentary canal and blood vessels (and in other situations), the action of which is not directed by the will, and, therefore, called involuntary. Under the microscope, this is made up of spindle-shaped cells each with a round nucleus in the middle. These are not striped and this kind is called *smooth* muscular tissue. The muscles of the heart are striated, but are branched and different from ordinary muscles. Therefore, we have the three varieties — striated, smooth, and heart muscle.

There are about four hundred muscles in the human body, most of them in pairs. All receive distinct names, and are connected with nerves and blood vessels. The blood vessels, for their nourishment, form a network around the fibers, while the nerves which control them form a closer connection. Most of the muscles attached to the bones have an enlarged middle (belly), and two ends tapering off into tendons, by means of which they are grown to the bones. The bones are roughened where the muscles are attached. The more rigid attachment is called the *origin*, and the more movable one the *insertion* of the muscle. Other muscles are flat and some surround cavities. They are named in various ways, according to their position, as the temporals, in the region of the temple; the pectorals, on the chest; the abdominals, etc.; from their direction, as a rectus, or straight muscle, an obliquus, or oblique muscle; from their uses, as flexors, which bend a joint; extensors, which extend it; levatores, which lift, etc.; according to attachment by tendons, as sternomastoid, mylohyoid, etc., and also in other ways.

The parts of the skeleton that move usually act as levers. The illustration shows, for example, the chief muscle which bends the



lower arm upon the elbow joint as a fulcrum. This muscle is a flexor, as it flexes the arm; its origin is at the shoulder, where it has two heads, and is, therefore, called the biceps; its insertion is on one of the bones of the forearm. The muscle which extends the arm is not shown in the illustration. It should be kept in mind that the action of a muscle is to contract not to expand. In contracting, it gets thicker and shorter, and it returns to its original state of extension. Other muscles perform the contrary action. Ordinarily muscles contract in direct response to nerve stimuli, but many causes influence them, such as their condition of nutrition, mental states, etc. A good illustration is found in the muscles of the face. They vary with the emotions and mental states, and the expression of the face is the result of the action of a number of muscles.

Mu'ses, in Greek mythology, goddesses included in the first place among the nymphs, but afterward held to be quite distinct from them. They had the power of inspiring song, and so poets and musicians were considered their pupils and favorites. They were first honored by the Thracians, and as this people first lived in Pieria, around Mt. Olympus, the Muses were called Pierides. There were at first three in number, though Homer sometimes speaks of a single Muse, and once refers to nine. This last is the number given by the poet Hesiod, who also gives their names; Clio, the muse of history; Euterpe, of lyric poetry; Thalia, of comedy; Melpomene, of tragedy; Terpsichore, of choral dance and song; Erato, of the poetry of passion; Polyhymnia, of hymns; Urania, of astronomy; and Calliope of epic poetry. They were usually said to be the daughters of Zeus and Mnemosyne. Homer speaks of them as the god-

desses of song, and as dwelling on the top of Mt. Olympus. They were also called the companions of Apollo, singing while he played on the lyre at the banquets of the gods. They were said to have won victories over the sirens in musical tournaments. Their worship among the Romans was merely copied from the Greeks, and never became truly national or popular. The fountains of Aganippe and Hippocrene on Mount Helicon, and the Castalian spring on Mount Parnassus, were the most famous places sacred to the nine Muses.

Mush'room. See BASIDIOMYCETES.

Musk, a substance obtained from the musk-deer (which see) and used as the basis of costly perfumes. That imported from Tonquin, China, is the best. Cheaper varieties come from India and Siberia. It is also used in medicine.

Musk-deer, a small deer separated from others by having no antlers in either male or female. The male has, however, sharp tusks projecting downward from the upper jaw which are used in fighting. These animals inhabit the high plateaus of Central Asia, usually living solitary and never in herds. They are shy, feeding mainly at night, and on account of the difficulty of approaching them, they are usually caught in traps. A full-grown specimen is about three feet long and twenty inches high at the shoulders. They vary in color, but are commonly grayish or yellowish-brown, and whitish below. The musk is found in a sac the size of a very small orange, situated on the under surface of the abdomen. The sack contains an ounce or more of the crude musk, which is so powerful in odor as to nearly overcome those who skin the animal and remove the pouch. When fresh, the substance is said to resemble moist gingerbread in color and consistency.

Muskegon (*mus-kē'gon*), **Mich.,** is situate on the Muskegon river, four miles from its mouth, in Lake Michigan. The river here widens into Muskegon lake, the best harbor on the east side of Lake Michigan. Muskegon is 40 miles northwest of Grand Rapids, and manufactures for shipment great quantities of lumber. It has also a number of foundries, machine shops, boiler works, and toy, wooden ware, and piano factories. Muskegon is the seventh largest city in the state, and has a population of 20,818.

Musk'mel'on, various forms of *Cucumis melo*, a genus of the gourd family, and native to southern Asia. The cultivation of muskmelons has become a very important commercial enterprise in North America. There are two general types in the market: (1) the furrowed kinds with hard rind, known as "cantaloupes," and (2) the netted kinds with softer rinds, known as "nutmeg melons." The nutmeg melons are those most commonly seen in the early markets; while the cantaloupes are longer-seasoned varieties. An important strain of the nutmeg type has recently become prominent under the name of "osage melons," which were developed in southern Michigan. Muskmelons are said to be a staple article of food among the inhabitants of Persia, Egypt, and Italy. Muskmelon growing is extensively carried on in the southern states, and the Mississippi valley in general is peculiarly adapted to the industry. However, New Jersey as yet supplies one-half of the market crop. See *Cucumis*.

Musk Ox or **Musk Sheep,** an animal combining characteristics of the ox and sheep.

MUSK OX.

It is now restricted to arctic America north of latitude 60°, but formerly was more widely distributed, and occurred in England as well as in America. Its favorite haunts are the upper tributaries of the Mackenzie river and the region about Great Bear and Great Slave lakes. It is about eight feet long and three feet high at the shoulders, and a full-grown male reaches a weight of four hundred and fifty pounds. It has long, smooth, brownish hair and lighter-colored underwool, the hair being abundant on the sides and the wool more plentiful on the back. The hairy coat is shed during hot weather. The horns meet in the middle of the forehead; they curve downward and outward and the tips point upward. These animals live in herds of twenty or thirty or upward and are hunted for food. The flesh of the males has a flavor of musk. They feed on grasses, lichens, willow shoots, etc.

Musk'rat or **Mus'quash,** a water rat peculiar to North America. Although adapted to an aquatic life, muskrats spend much time on the shores of the lakes and rivers which they inhabit. The animal is the largest of the rat family, being about one foot long, without the tail, which is six or eight inches in length. The latter is different from the tail of any other rat, being scaly and flattened from above downward. The fur is of a dark, glossy brown and is of commercial value. They live in burrows in the bank, with one or more entrances under water. For winter, they build dome-shaped houses of sedges and grasses plastered together with mud. These project above the

surface of the water, but the entrances are underneath. They feed mainly on roots and stems of water plants. The name is also applied to the desman of the Old World and a rat of India. All of these animals have a musky odor.

Mussel (*mus's'l*), the common name for a number of bivalve mollusks. The common mussel of salt water (*mytilus*), living along the shores of the North Atlantic, is often eaten in Europe, but rarely in America. It is abundant between high and low water marks, and is usually anchored by a tuft of yellowish silken filaments (Lyssus) spun from glands in its body. The common fresh-water clam is the fresh-water mussel. These mollusks belong to the group Lamellibranchiata.

Musset (*mü-sā'*), **Alfred de,** was born at Paris, Nov. 11, 1810, the son of an officer in the war office. He was very impulsive from his childhood, and grew up handsome and fascinating, though he kept something of the spoilt child all his life. He thought first of law, next of medicine, then of art, but at eighteen discovered himself to be a poet, and hardly a year later published his *Tales of Spain and Italy*, a volume of unequal verse. He was now a brilliant youth, was warmly received by the circle that eddied around Victor Hugo, and was flattered by society. In 1833, appeared two of his greatest works, the tragical comedies, *André del Sarto* and *Marianne's Caprices*. It was of Marianne that De Musset answered, when asked where he had found her character, "Nowhere and everywhere; she is not *a* woman, she is woman." Next followed the famous poem of *Rolla*. He first met George Sand in the summer of 1833, soon fell in love with her, and the next spring the two made a tour of Italy, where De Musset came near dying from brain fever. Ever after he had times of deep depression. The patronage of the duke of Orleans, the warm friendship of a small circle of friends, and his appointment in 1838 to be librarian at the home office, did something to take him out of himself; but he was always as unsteady in character as in genius, and the feverish activity that sometimes seized him spent itself in splendid plans and unfinished poems. In 1840, his health broke down and he wrote but little. As Heine said, he was "a young man with a splendid past"; he felt himself an old man at thirty. The success of his play *A Caprice*, in 1847, put life into him for a short time. He died at Paris of heart disease, May 1, 1857.

The Night of May and *The Night of October* are perfect and undying lyrics. As a poet of passion he comes close to Byron in power. His plays have not their equals in 19th-century literature for originality, wit, and real dramatic genius. His largest prose work was the famous *Confession of a Child of the Age;* but greater are his short stories and tales, such as *Emmeline, Pierre and Camille, Mademoiselle Mimi Pinson*, and *Margot*. De Musset's whole work fills but ten small volumes, but it is not too much to say that they include some of the finest poetry, the greatest plays, and the best short stories in French literature.

Mustard, species of Brassica, a genus belonging to the mustard family. The genus contains about 100 species of herbs, natives to north temperate regions. To the same genus belongs the cabbage, with its cauliflower and kale varieties, rape, rutabaga, common turnip, etc. The true mustards are *B. alba* (white mustard), *B. nigra* (black mustard), and *B. juncea* (Chinese mustard). Table mustard is the flour formed from grinding the seeds, mostly from black mustard, though the white and Chinese mustards are also used. The white and black mustards often become widely distributed weeds. The large, soft, basal leaves of these forms are also frequently used for "greens."

Mutualism (*mū'tu-al-ism*), (in plants), that form of symbiosis in which the two plants are of mutual benefit. By many this condition is thought to be illustrated by the lichens, the algæ and fungi constituents being thought to be mutually helpful. See SYMBIOSIS.

Mycelium (*mi-sē'li-üm*), (in plants), the ordinary body of a fungus, consisting of branching colorless threads more or less interwoven. Sometimes the threads are so loosely interwoven that the mycelium resembles a delicate cobweb; at other times the threads are so closely interwoven that the mycelium becomes a felt-like mass. The latter form of mycelium may often be seen upon preserved fruit or jelly, in which case it can be removed like a thick piece of felt. See FUNGI.

Mycenæ (*mi-sē'nē*), a very old city in the northeastern part of Argolis, in the Peloponnesus, built upon a high crag, and said to have been founded by Perseus. It was the capital of Agamemnon's kingdom, and at that time the chief town of Greece. It was destroyed by the people of Argos, and, though rebuilt, never afterward prospered. Its ruins are still to be seen. The most celebrated of them are the "Gate of Lions" and the "Treasury of Atreus." Excavations carried out by Dr. Henry Schliemann brought to light, in 1876, another underground treasury and several ancient tombs, vases, weapons, gold death-masks, and other ornaments of hammered gold. These objects seem to show a type of art coming from Mesopotamia through Phœnicia and Asia Minor, and manifesting little or no trace of Greek tastes or customs. Their date seems to be about that of the Doric invasion of the Peloponnesus.

Myriapoda (*mir'i-ap'o-da*), a class of jointed animals containing the centipedes and thousand-legged worms. The name signifies many-footed. The body is worm-like and

jointed. There is a pair of legs for each joint. The head carries antennæ, jaws, and eyes, and there is no distinction between thorax and abdomen. The Myriapods form a group equivalent, respectively to that of the crustacea, spiders, and insects, and these four classes make up the sub-kingdom Arthropoda. See ARTHROPODA, and CENTIPEDE.

Mycorrhiza (*mī-kō-rī'zd*), (in plants). The name means "root fungus," and refers to the fact that there exists an intimate association between certain fungi of the soil and the roots of higher plants, such as orchids, heaths, oaks, and their allies, etc. The delicate mycelial threads of the fungus spread through the soil, enwrap the rootlets with a mesh of threads, and penetrate into the cells. By this means the fungus obtains food from the rootlet as a parasite, but it is also thought that the fungus threads spreading through the soil are of great service to the host plants in aiding their rootlets in absorbing. If this be true, there is a mutual advantage in the association, for the small amount of nourishment taken up by the fungus is more than repaid by its assistance in absorption. See MUTUALISM.

Myrmidons (*mĕr'mi-dŏnz*), the famous followers of Achilles in the Trojan war. They were an old Thessalian race who colonized the island of Ægina. According to Greek story, Zeus peopled Thessaly by changing the ants into men; hence the myrmidons, which means ants.

Myrrh (*mĕr*), a gum resin produced by a tree growing in Arabia, and also in Somali Land, in Africa. The myrrh tree is small and scrubby, spiny, with whitish-gray bark, with smooth brown fruit about as big as a pea. The myrrh flows from the pores of the bark in oily, yellowish drops, which slowly thicken, harden, and become darker colored. Myrrh was known and highly valued in very early times. It was among the presents which the wise men from the east brought to the child Jesus. Myrrh is sold in tears and grains, or in irregular-shaped and various-sized pieces, yellow, red, or reddish brown in color. It was used by the Egyptians in embalming, and is employed now in medicine. All myrrh comes either from Aden or from Bombay.

Myr'tle, a beautiful evergreen shrub or moderate-sized tree, with glossy leaves, black berries, having a pleasant, spicy odor, and white flowers. This is the common myrtle, which is native to the countries of the Mediterranean. Among the ancient Greeks the myrtle was sacred to Venus, as the symbol of youth and beauty. Victors in the Olympian games were crowned with wreaths of its leaves. The myrtle of Peru and Chile has red berries and smaller leaves. The berries have a pleasant flavor and are eaten. The periwinkle, which is a very common running plant in the United States, is often improperly called myrtle.

Mytile'ne. See LESBOS.

Myxomycetes (*miks-o-ma-sē'tēz*), organisms commonly called "slime moulds," which do not seem to be related to any group of plants, and have raised the question as to whether they are to be regarded as plants or animals. The ordinary body is a mass of naked protoplasm, called the "plasmodium," suggesting the term slime. This body slips along like a gigantic amœba. Slime-moulds are common in forests, upon black soil, fallen leaves, decaying logs, etc., and are slimy yellow or orange masses, ranging from the size of a pin-head to as large as a man's hand. In certain conditions these slimy bodies come to rest and organize elaborate and often very beautiful spore-cases. As is often remarked, the body of these organisms is animal-like, while the sporangia are plant-like.

N

Nachtigal (*näk'tē-gäl'*), **Gustav,** a German explorer and traveler, was born at Eichstedt, Feb. 23, 1834, studied medicine and served as surgeon in the army until 1863, when he went to Algeria and Tunis for his health. In 1868, he was selected to carry presents from the king of Prussia to the sultan of Bornu, and starting from Tripoli in 1869 he went through Fezzan, Tibesti, Wadai, Darfur, Kordofan, and from Cairo home, arriving Nov. 22, 1874. Being one of the first Europeans to visit these states, it placed him among the foremost of modern travelers. His collection of information is recorded in the three volumes of *Sahara und Sudan.* In 1884, he was sent to annex Togoland, Kameruns, and Lüderitzland for Germany, and died on his return journey, off Cape Palmas, Liberia, on April 19, 1885. See Dorothea Berlin's *Erinnerungen au Nachtigal.*

Nadir (*nā'dēr*), an Arabic word used by astronomers to denote the point just opposite the zenith. The *zenith* being the point immediately over head, the *nadir* might be defined as the point immediately under foot. A plumb bob suspended by a string always points to the nadir and to the zenith, at the same time.

Na'dir Shah, of Persia, belonged to a Turkish tribe and was born at Khorasan in 1688. After entering the service of the governor, he was degraded for some offense and entered a life of lawlessness, becoming the head of a robber band of three thousand. Persia being at that time under the tyrannical rule of an Afghan, Nadir undertook to overthrow him. Persians enlisted under him, and after the fall of the Afghan, and the accession of the rightful heir, Tamasp, to the throne, Nadir was made governor of the provinces of Khorasan, Mazanderan, Seistan, and Kermân. He was sent against and defeated the Turks in 1731, and in 1732 dethroned Tamasp and placed the infant Abbas III. thereon. On the latter's death, in 1736, Nadir was crowned Nadir Shah, and resumed the war against the Turks. He conquered Afghanistan, ravaged the northwest provinces, and took Delhi with booty to the amount of $100,000,000, including the great Koh-i-noor diamond. Then he became suspicious and tyrannical and was assassinated June 20, 1747. See H. Maynard's *Nadir Shah* (Stanhope Essay, 1885.)

Nagasaki (*nä-gä-sä'kē*), a seaport town of Japan, was for two centuries the only harbor in the kingdom open to the world. In 1859, it became one of the five open ports. Its harbor is a beautiful inlet, of over three miles, having, near its head, the island of Deshima, which from 1637 to 1859 was the trading-post and prison-house of the Dutch traders. The great Takashima coal mine, on an island of eight miles seaward, makes Nagasaki an important coaling station. The foreign settlement is on the east side of the harbor. The city has English, American, and Dutch missionary societies, and a community of native Christians. Population in 1898, 107,422.

Nagoya (*nä-goi'ä*), one of the largest and commercially active cities of Japan, the chief town of the province of Owari, lies at the head of the shallow Owari bay, about 30 miles from its port, with which it communicates by means of light-draught steamers. It is one of the largest seats for pottery works, and turns out large quantities of fans and enamels. Nagoya castle, in about 400 acres of grounds, to the north of the city, was built in 1610, and is now the headquarters of the Nagoya military district. A superior court, middle school, girls school, normal school, hospital, prefecture, telegraph and post offices are the buildings of foreign style. Population 244,145.

Nagpur (*näg-pör'*), a city in British India and capital of the Central Provinces. It is a beautiful town, well wooded, having attractive gardens and suburbs, but its high temperature makes it unhealthy. It manufactures fine cloth fabrics and has a good trade in wheat, salt, spices, and European goods. Here it was that 1,350 British under Colonel Scott defeated 18,000 Mahrattas on Nov. 27, 1817. Population 125,000.

Na'hum, the seventh of the minor prophets of the Old Testament. His book is inscribed *The Burden of Nineveh,* the book of the vision of Nahum the Elkoshite. It speaks of the infallibility of divine judgment against the enemies of God and his goodness toward believers, and predicts the destruction of Nineveh. Students have placed the date of this prophecy somewhere between the fall of Thebes (666 B. C.), which is mentioned, and 606 B. C., the date of the destruction of Nineveh. Of his personal history nothing is known. He is supposed to have been a native of Elkosh (modern Elkauseh), upper Galilee, or of Alkôsh, on the left bank of the Tigris, where the grave of the prophet is shown.

Nails. The making of nails by hand has been an established manufacture in Birmingham, England, for 300 years. Before the successful but very gradual introduction of machine-made nails, the men, women, and children, to the number of 60,000, were engaged in the industry in that district. They all worked in small shops or sheds attached to their houses. In 1861, the number employed

was only 20,000, and of these nearly one-half were females. Hand-made nails are being rapidly supplanted by machine-wrought and cut nails. The machine, which is the invention of Mr. G. H. Perkins, of Philadelphia, is fed with heated (to black heat only) strips of metal, having sufficient breadth and thickness for a nail to be made, and with its slicer shears off the "nail blank," which, falling down, is firmly clutched at the neck till a heading die, moving with force enough, strikes against its upper end and forms the head, and the nail is completed.

Nana Sahib (*nä'nä sä'hib*), the name applied to Dundhu Panth, the adopted son of the ex-peshwa of the Mahrattas, when he led the Indian mutiny of 1857. He was born about 1825, and educated as a Hindu nobleman, but was active in stirring up dissatisfaction with English rule, and at the outbreak of the mutiny was proclaimed peshwa, and was directly responsible for the massacres at Cawnpore. After the suppression of the rebellion, he fled to Nepal. The date of his death is unknown, probably 1860.

Nancy (French, *nôn-sē'*), capital of the French department of Muerthe-et-Moselle, lies on the left bank of the river Meurthe, at the foot of the hills. It comprises both the old and new towns, and contains fine squares and beautiful buildings, among them being the Hôtel-de-Ville, the bishop's palace, the theatre, the churches Des Cordeliers and Nôtre Dame de Bonsecours (1738), and St. Epvre. The statue of Stanislaus Leszcynski, king of Poland, who lived here from 1735 to 1766, as the duke of Lorraine, stands in the principal square. The city has manufactories of cotton and woolen goods, artificial flowers, iron, etc., but its greatest industry is embroidery on cambric and muslin. From the 12th century it was the capital of the duchy of Lorraine; it is also the scene of the death of Charles the Bold, 1477, and the birthplace of Callot and Claude Lorraine. The town was occupied by the German army in 1870. Population in 1896, 96,306.

Nanking (*nan-kin'*), capital of the province of Kiangsu, and formerly of China, is situate on the Yangtse river, 130 miles from its mouth. Since the removal of the capital to Peking, the official name has been Keangning-fu. When it was the capital of the Taiping rebels, from 1853 to 1864, the latter destroyed the Porcelain tower, the summer palace, the tomb of the kings, and all the other buildings for which it was famous, and also part of the walls, formerly 20 miles around, and in some places 70 feet high. Since its recapture by the Chinese, in 1864, it has recovered a little. The manufacture of nankeen and satin has been resumed. It was captured by the English in 1842. In 1899, the Chinese government declared Nanking open to foreign trade. Population 225,000.

Nansen, Fridtjof, a Norwegian explorer, was born near Christiana, Norway, Oct. 10, 1861. When 21 years of age he became curator of the zoological department of the museum at Bergen and devoted himself to its improvement. In a number of exploring expeditions he showed such fertility of resource and such physical endurance that he was given larger fields of operation. In 1882, he explored the seas about Greenland. In 1888–89, he crossed the peninsula of Greenland passing over its ice cap from east to west, and returned safe, contrary to the prophecies of his critics. With his thoughts still on the problems of the polar seas he designed a boat in 1892 to withstand the effects of any ice jam; and in this vessel, the *Fram*, he set out from Vardö, Norway, 1893, intending to reach the pole by sailing east until the right opportunity should offer for permitting his boat to be frozen into the ice pack. It was his belief that the pack itself would drift him across the polar sea. His surmises were in part correct. He attained the highest latitude north, but not within many leagues of the pole. He was not heard of again until Aug. 13, 1896, when his safe return was announced. His "farthest north" was about three degrees farther north (86° 14′ N.) than the point attained by the *Alert* in 1876. His published works are *Across Greenland* and *Farthest North*. He is still engaged upon the problem which has so long absorbed his attention. He lectured in the United States after his return from the polar expedition of 1893–96, upon which his chief distinction rests.

FRIDTJOF NANSEN.

Nantes (*nants*, French *nônt*), the ninth largest city of France and capital of the department of Loire-Inférieure, lies on the right bank of the Loire, 35 miles from its mouth. Demolished between 1865 and 1870, Nantes has grown by nature and by art to be one of the handsomest cities in France. Its unfinished cathedral (1434–1852) contains the celebrated monument to the duke and duchess of Brittany. Among its noteworthy buildings are the ducal castle, the occasional residence of Charles XIII. and the place where, on April 13, 1598, Henry IV. signed the famous edict of Nantes; the Church of St. Nicholas, the palace of justice, the theatre, post office, museum, and library of 50,000 volumes. Nantes, the former capital of Brittany, is the scene of the marriage of Anne of Brittany to Louis XII. (1499), the embarkation of the

Young Pretender (1745), and the arrest of the Duchess de Berri (1832). Population (1896), 123,902.

Nan'ticoke, Pa., a borough of Luzerne county, on a branch of the Susquehanna river, and on the Central of New Jersey, the Delaware, Lackawanna, and Western, and the Pennsylvania railroads, twenty miles southwest of Scranton, and eight miles from Wilkesbarre, the county seat. A portion of the town, known as W. Nanticoke, lies across the river in Plymouth township. Its chief industry is the shipping and hauling of coal, being in the anthracite coal-mining regions. Population of Nanticoke, 12,116.

Nantuck'et, an island off the southeast coast of Massachusetts. It is about 15 miles long and much frequented as a summer resort. The town of Nantucket lies on the north shore. It was formerly a great whale-fishing center. Population 3,006.

Naphtali (*naf'tă-lī*), the son of Jacob by Bilhah, Rachel's maid. The name is explained in Genesis xxx. 8. The seat of the tribe was in the eastern half of upper Galilee, in a country sloping to the headwaters of the Jordan and the Sea of Galilee. After the wars with Siserà, in which the tribes took a prominent part (Judg. iv; v. 18), and with Midian (Judg. vii. 23), we hear little of Naphtali. The tribe was depopulated in the first Assyrian captivity by Tiglath-Pileser (2 Kings xv. 29; Isa. ix. 1).

Naphtha (*naf'tha* or *nap'tha*) is derived from a Persian word meaning "to exude" and was originally used to designate the liquid hydrocarbons that oozed from the ground about the Caspian sea. It was also applied to the natural oils, found universally, and to the oil derived from the Boghead mineral in Scotland. But since the discovery of Scotch paraffine and American petroleum the name naphtha has been applied only to the lighter, explosive, and unsafe oils, and, strictly speaking, to the products of distillation from mineral oils, coal tar, india rubber, bones, peat, and wood, the latter being known also as methyl alcohol. Petroleum (American) contains from 15 to 20 per cent. of naphtha, which is separated into gasoline, benzine, and benzoline. The tar derived from the reduction of coal yields from 5 to 20 per cent. The spirit obtained from the destructive distillation of india rubber is called caoutchin. Bone naphtha, or Dippel's animal oil, is obtained by distillation of bones in the manufacture of animal charcoal.

Napier (*nā'pe-er*), Sir **Charles James**, a British general, the conqueror of Sind, and a descendant of Napier of Merchiston, was born Aug. 10, 1782, at London. Being commissioned in his 12th year, he served during the Irish rebellion, and, at the battle (Corunna) in which Sir John Moore died, he was five times wounded and taken prisoner. He returned to England and gave himself to literary work, but in 1811 he went to the Peninsula, where he took part at Coa, Busaco, — where his jaw was broken and eye injured by a shot — Fuentes d'Oñoro, and Badajoz. He also took part in the Anglo-American war of 1812. In 1818, he was made governor of Cephalonia; in 1838, a K.C.B., and in 1841 was sent to India to command the army of Bombay against the Ameers of Sind. Here his most remarkable feat was the destruction of the fortification of Emaun Ghur, 1843, followed by the battle of Meanee (Miani), where, with 2,800 English and Sepoys, he defeated 22,000 Baluchs. After the annexation he was appointed governor of Sind, but differences with the authorities caused him to return to England in 1847. He died near Portsmouth, Aug. 29, 1853. See the biography by his brother, and the short *Life*, by Sir W. Butler.

Na'pier, Sir **William Francis Patrick**, K.C.B., the brother of Sir Charles, was born near Dublin, Dec. 17, 1785. He served in the Peninsular campaign and retired as a lieutenant-general. He also wrote a famous *History of the War in the Peninsula, The Conquest of Scinde*, and the *Life of Sir Charles Napier*. He died at Clapham, London, Feb. 10, 1860. See his *Life and Letters*, edited by Bruce.

Naples (*nā'plz*), until 1860 the capital of the kingdom of Naples, is the largest Italian city and one of the busiest ports, exporting wine, olive oil, chemicals, perfumery, live animals, animal products, hemp, flax, cereals, and importing cereals, metals, cottons, woolens, earthenware, silks, groceries, etc. The well-known proverb, "See Naples and die," became used on account of its attractiveness and delightful climate.

Naples lies upon the base and sides of a hill-range rising from the sea and divided into two unequal parts. The most ancient part of the city, in the eastern crescent, is divided from north to south by its oldest street, Via Toledo (now Via di Roma), and is the most populous district of its size in Europe. Back of the wharf extending to the Castel del Carmine lies the poorest and most densely-peopled quarter. The city is always full of life, the streets crowded and noisy. There are few buildings of any note, the forts and gates, university, royal palace, catacombs, national museum, and law courts only, being worth a visit. It has three large libraries, the national, the university, and the Brancacciana. The university, which was founded in 1224, has a faculty of 81 professors, and a student body of 5,465. Population (1899) 544,057.

Na'ples, a former kingdom in Southern Italy, owed its creation to Greek colonists, the two settlements, Palæopolis and Neapolis, long existing as one community, Parthenope. After the subjugation by Rome only Neapolis remained and became Rome's ally. After resisting Pyrrhus and Hannibal, it fell, by

treachery, into the control of Sulla's friends, who murdered its people (82 B. C). Under the empire it became a famous residence place on account of its poets and its climate. After the fall of Rome, it sided with the Goths, but was taken by Belisarius (536), and six years after by Totila. Soon after the Byzantine emperors acquired it through Narses and it was made the head of a duchy. As such it revolted and remained independent until conquered by the Normans in the 11th century. In 1266, the popes gave the sovereignty of Naples to Charles of Anjou, but during the reign of Robert I. the predominance of the papal party, the ravages of the Germans, the depravity of Joanna, Robert's heiress, and the unsuccessful attempts to recover Sicily, were the only important events that marked the Angevin rule, which ended with Joanna II. in 1435. Then succeeded the Aragon rule. Between 1494 and 1504, France and Spain fought for the possession of Naples, but it was united with Sicily, forming the Two Sicilies, and was governed by Spanish viceroys down to 1707. In that year Austria wrested Naples from Spain only to give it, in 1735, to Don Carlos, who founded the Bourbon rule. In 1789, it was invaded by the French troops and again, in 1806, when Napoleon proclaimed his brother Joseph king. In 1808, the crown was given to Joachim Murat, and on his defeat and execution in 1815, the Bourbon monarch, Ferdinand IV., was restored. The revolutions of 1821 and 1848 led to the overthrow of the Bourbon government by Garibaldi, and to the incorporation of Sardinia and Naples with the kingdom of Italy in 1861. Naples (Napoli) is to-day a province of Italy, with an area of 350 square miles, and a population (1900) of 1,197,743. See *History of the Kingdom of Naples*, by Colletta, translated by S. Horner.

Napo'leon I., the first emperor of France, was born at Ajaccio, Corsica, Aug. 15, 1769, and ten years later entered the royal military school at Brienne le Chateau, from which he was transferred to the military school at Paris. From here he graduated as second lieutenant, and began the ambitious career that characterized his after-life by entering the first revolution and attempting to seize the Corsican cities for France, but failed. As lieutenant-colonel in the second revolution, he attempted to capture Sardinia, but failing, he fled to France with his entire family, and looked here for glory and renown. He joined the army under Carteaux, and acted as chief of battalion against the Marseillais, and was promoted to general of brigade for planning and causing the fall of Toulon. He was given command of the army of Italy in February, 1796, and two days before entering upon the campaign he married Josephine, the widow of General Beauharnais. In Italy, he began the course which marked him as a man of determination, force, and quick action, and by wonderful strategies defeated the allied forces of Italy and Austria. In this campaign he lost not even a single engagement, but moved so rapidly and decisively, that with an army of about half the number of the allies, he won repeated victories and levied large contributions from defeated towns. After his victory in Italy, he decided to move on Vienna, but Austria made overtures for peace, ceding to France Lombardy, Belgium, and the Ionian islands at the conclusion of the treaty.

On his return to France, the secretary, fearing that his ambition would lead him to foment a revolution for personal ends, placed him in command of the army of England, with which he determined to conquer Egypt and found an eastern empire. He reorganized the army and embarked from Toulon in May, 1798. Taking Malta on the way, he arrived at Alexandria and marched on Cairo, which he entered on July 24. His fleet was destroyed in the Nile by Nelson, and he turned his attention to Syria and formed a brilliant idea of overthrowing Turkey and entering Europe through Asia Minor and Constantinople. However, hearing that the armies at home were meeting with misfortune, he embarked for France secretly, leaving the army in command of Kléber. He arrived at Paris just in time to fill the want of the leaders, who were looking for a man to place at the head of the new movement. The revolution of Nov. 10, 1799, gave rise to the formation of a new constitution, which Napoleon assisted in framing, and by it the provisional government was vested in three consuls, of which Napoleon was elected president. He thus became practically sole ruler of France. Then, in 1800, after failing to conclude peace with Austria and England, he determined to stake all on the chance of a campaign, and entered Italy desperate for victory. He was saved from defeat by Melas, on the plain of Marengo, by the timely arrival of Desaix's army, and, upon Moreau's victory at Hohenlinden, he made peace with Germany and England, gaining all of Italy.

He then turned his attention to the formation of the permanent civil institutions, restoring the church, establishing the judicial system, the codes, the system of local government, the university, bank of France, and the Legion of Honor. This done and peace thoroughly established, he was fired by the ambition to become the ruler of the world, and after being elected first consul for life, he ruptured the peace with England by proceeding upon Holland, Genoa, and Piedmont, demanding that England should suppress all papers criticising his actions, and drive all French refugees from its shores. He entered Germany, seized Hanover, and assumed the crown. He then roused the Royalists by executing the Duc D'Enghien, and winning the Republicans over to his way of thinking, he chose the title of emperor, which was confirmed by the senate, May 18, 1804. The

advance upon England was met by a coalition of the powers of England, Austria, Prussia, and Russia; but Napoleon, nothing daunted, marched upon Austria and defeated her at Austerlitz, in December, 1805, breaking up the coalition. But Prussia gathered her armies in August, 1806, and was joined by Russia. They were defeated at Jena and Auerstädt on October 14, and Berlin was taken October 27. Then the Russians were defeated at Friedland in June, 1807, and by the ensuing peace Prussia lost half her territory. Napoleon's great aim was the humiliation of England, and to this end he caused all continental ports to be closed against her; but England retaliated by defeating his army in Spain and Portugal. In Germany, also, revolt was rife, Austria leading the way, and after several attempts to cross the Danube, Napoleon defeated them at Wagram, July 5, 1809, and received a large part of their territory as indemnity. He, however, greatly offended the czar by giving Galicia to Poland. His wife bearing him no children, he divorced her and married Maria Louisa of Austria, by whom he had a son.

His persistency against England brought him into conflict with Russia, and Napoleon determined to invade that country. So, with 600,000 men, he crossed the continent, being greeted by the king of Prussia and emperor of Austria, and entered Russian soil on June 24, 1812. He defeated the Russians at Borodino and entered Moscow on Sept. 14, on which a great fire broke out and lasted until the 20th. He resolved upon a retreat on Oct. 18, and upon reaching the frontier had but 100,000 men left. He returned to France to raise new armies, while Russia joined with Prussia and Saxony to withstand his attack. They met, in a victory for Napoleon, May 2, 1813, at Lutzen, and Austria was appointed a mediating power to effect peace or declare war in case of refusal. Napoleon paid no attention to the ultimatum, so on Aug. 11, he found himself at war, with 400,000 men, with all the powers of Europe. He was terribly defeated at Leipsic between Oct. 14 and 19, and retired to Mainz with only 70,000 men. The allied armies separated and, after the defeat of Blücher four times in four days by Napoleon, they joined forces and marched upon Paris and took it March 30, 1814. Wellington then came from Portugal and also entered French soil. Napoleon offered to abdicate in favor of his son, but this was refused, and he retired unconditionally, on April 11, 1814, being given the sovereignty of the island of Elba.

The accession of the Bourbons was unpopular and Napoleon thought he could save France from ruin, so on March 20, 1815, he again entered Paris at the head of the army. He had, however, become old and ill, and while his conceptions and plans were as brilliant as ever, the execution of the campaign of Waterloo failed. The English under Wellington, and the Prussians under Blücher, were against him. On the 16th of June he defeated Blücher at Ligny, but failed to follow up the victory, so that when he turned against Wellington, the Prussians, unknown to him, were in the rear, and this caused the defeat of Waterloo on June 18. He fled to Paris, and finally abdicated, June 22. Finding escape impossible he surrendered to Captain Maitland, of the *Bellerophon*, on July 15, and was sent a prisoner to St. Helena, where he arrived Oct. 15, 1815, and died of cancer of the stomach on May 5, 1821. See Seeley's *Short Life; Memoirs of Napoleon Bonaparte*, by Bourrienne, and the *Correspondence of Napoleon I.*

Napoleon III. or **Charles Louis Napoleon Bonaparte**, the second French emperor, was born at Paris on April 20, 1808. His father was king of Holland and brother of the first emperor and his mother was the stepdaughter of Napoleon I. He was educated by his mother in exile in Switzerland and at the gymnasium at Augsburg, but until 1836, during his life in Switzerland, he was, essentially, a student and writer. Nevertheless, the prestige of the institutions of Napoleon I. cast some reflected light on Charles Louis, who looked with longing eyes toward the throne of France, then occupied by Louis Philippe. Indeed, he went so far in 1836 as to appear among the military at Strasburg and endeavor to win them over to his side, but failed, and was taken and brought to the United States without trial. He, however, again returned to Switzerland, of which government France demanded his expulsion, but it was refused. To avert trouble he went to England and in 1840 made his second attempt to gain the throne by landing at Boulogne, but was this time taken prisoner and sentenced to imprisonment for life at the fortress of Ham. Here he remained, writing many books, and editing the French Encyclopedia, *Dictionaire de la Conversation*, until he made his escape to Belgium, May 25, 1846. Immediately upon the success of the workingmen in the revolution of 1848, he returned to France and was elected to the constituent assembly from Paris and three other districts, but resigned his seat two days after taking it and left France. In September, 1848, he was recalled by his election from five districts and immediately began the canvass for the election to the presidency, which he received by an overwhelming vote. For a while he lived up to his oath of allegiance to the republic taken on Dec. 20, but only as a cloak to place the military under control of his friends and lay plans for the resumption of the monarchy. On Dec. 2, 1851, by force of arms, he routed the national assembly and in that same month he was re-elected for ten years, only to assume the imperial title within a year. The empire being now established, he broke up the political parties,

courted the clergy, and adopted a brilliant foreign policy. This led to the Crimean war and the difficulty with Austria in Lombardy. While in these operations he enjoyed the support of Great Britain, his relations to Prussia were affected by jealousies, which finally led to the Franco-Prussian war, which proved the end of Napoleon III's power. He surrendered himself in September, 1870, and was held a prisoner at Wilhelmshöhe, near Cassel, until the declaration of peace, after which he joined the empress at Chiselhurst, near London, where, after writing a *History of Julius Cæsar*, he died on Jan. 9, 1873. See Blanchard Jerrold's *Life of Napoleon III.; Napoleon the Little*, by Hugo; *Essay on Napoleon*, by Channing.

Narcis'sus, according to a Greek fable, was the son of the river god Cephissus and the nymph Liriope, in Bœotia. The boy was very beautiful and more than vain of his beauty. As a punishment, Nemesis made him fall in love with himself, on seeing the reflection of his face in a stream or fountain, and he died of this lovesickness. From the place where he died sprang the flower which bears his name.

Narcot'ics. See POISONS.

Narragan'sett Bay, in Rhode Island, is about 28 miles in length, reaching north from the Atlantic into the state, and from 3 to 12 miles wide. It divides Rhode Island into two unequal parts, of which the western part is much the larger. It contains several islands, of which Aquidneck, Canonicut, and Prudence are the largest. The rivers Pawtuxet and Pawtucket empty into it.

Narragan'setts, a tribe of Indians belonging to the great Algonquin family. When New England was settled, they lived in what is now Rhode Island. They then numbered 7,000 or 8,000, but were more civilized and less warlike than other of the New England tribes. In 1621, their sachem, Canonicus, sent a bundle of arrows tied with snakeskin to the Plymouth colony, signifying hostility. Governor Bradford changed their purpose by promptly returning the skin filled with bullets and powder. Roger Williams went to them when exiled from Massachusetts, and had influence in their councils, persuading them to peace in 1636, when they were again hostile to the whites. In King Philip's war, more than thirty years afterward, they were believed to be aiding the enemy, and the English, with the Mohegans and Pequots, burned their fort. They retaliated and a large force was sent to punish the hostile Narragansetts, and they were nearly exterminated. The few who remained became civilized, lived in peace with the whites, and lost their native language. There are now only about 150 Narragansetts.

Nar'ses, statesman and general, one of the last supports of the old Roman empire, was born in Persian Armenia about 478 A. D. From a low position he rose to be keeper of the privy purse to Emperor Justinian. Some years later, he was given sole command in Italy. His conduct of this campaign was very masterly; having no transports, he marched his army around the shores of the Adriatic, encountered the Ostragoths at Taginae and defeated them, slaying their king, Totila, and, after further successes and taking possession of Rome, Narses completely destroyed the Gothic power in the peninsula. He was then made prefect of Italy and held court at Ravenna until the death of Justinian, when, being accused of avarice and extortion by the people, he was removed by Justin, 567. Narses died at Rome about 573 A. D. See Goth's *Justinian*, and Hodgkin's *Italy and Her Invaders*.

Nash'ua, a manufacturing town of New Hampshire, in Hillsboro county, at the junction of the Merrimac and Nashua rivers, and about 40 miles from Boston. By means of a three-mile canal, the falls of the Nashua river furnish power to many cotton factories, paper, carpet, and iron mills. Population 23,898.

Nash'ville, the capital of Tennessee, lies mainly on the left bank of the Cumberland river, about 200 miles from the Ohio, which is here crossed by a suspension and a railway drawbridge. It is a well-built city, containing the new capitol, a penitentiary, and a large insane asylum. Besides an excellent school system, it is the seat of Nashville university, Vanderbilt university, Central Tennessee college, Fisk university, and Roger Williams university (the last three for colored students), and the State Normal school. It has a good trade in cotton, tobacco, flour, oil, paper, timber, leather, iron, and spirits. The town was founded in 1780 and became the capital in 1843. General Thomas defeated the Confederates under Hood here, in December, 1864. Population 80,865.

Nasmyth (*nā'smith*), **James,** a British engineer, and the inventor of the steam hammer, was born at Edinburgh, Aug. 19, 1808, and early showed an inclination for mechanics. At seventeen, he built a small working engine for crushing, made five models of a condensing engine, and a road locomotive. In 1839, he had to turn out a large wrought-iron paddle-shaft, and invented the steam hammer to do the work, but it was not perfected until 1842. He patented his invention, and it was adopted by the government in 1843. In 1856, he retired and died at London, May 7, 1890. See *Life*, by Smiles.

Nast, Thomas, an American caricaturist, was born in 1840 at Landau, Bavaria, and came to this country in 1846. At the age of fourteen he studied drawing for six months with an instructor, and a year later was employed as draughtsman on *Frank Leslie's*

Illustrated Newspaper. Five years later, as special artist of this periodical, he was sent to England, and from there went to Italy, sketching the history made by Garibaldi, for the illustrated papers of New York, Paris, and London. In 1861, he returned to New York and began his war sketches and political cartoons for *Harper's Weekly*, which were immensely popular. Later he has appeared with success on the lecture platform, and has illustrated several books, among them those of Petroleum V. Nasby, and *Nast's Illustrated Almanac*.

Natal (*nă-tăl'*), a British colony on the southeast coast of Africa, was discovered by Vasco da Gama on Christmas day, 1497, and in 1800 was peopled by ninety-four separate tribes of natives. Tyaka, a chief of the Amazulu tribe, ruled the country from 1805 to 1828, when he was killed and his brother, Dingaan, placed on the throne by a political faction. Then the Boers, who had left Cape Colony to escape English rule, began a series of struggles with the natives, and in 1838, when a commission of Boers was murdered by Dingaan, a large body entered Natal to avenge the murder. The Dingaan faction was at that time opposed by the followers of his brother Umpande, and with these the Boers united, attacking Dingaan and killing him. Umpande then succeeded, recognizing the Boers as lords of the soil of Natal. In December, 1838, Sir George Napier, governor of Cape Colony, was sent to take possession of the territory, but his Highlanders were compelled to go to Cape Kaffir on account of disturbances there, whereupon the Boers hoisted the flag of the republic of Natalia. Later two English men-of-war forced a landing at Durban, and after a short struggle drove the Boers back to their capital. Peace negotiations were then concluded, and the larger portion became subjects of the British crown. But some crossed the mountains and entered what is now the Transvaal.

The colony was formally annexed to the British dominions in 1843, and in 1844 became a part of the Cape of Good Hope. In 1856, Natal was declared to be a separate colony, and was given a sort of independent government, and before 1860 a great part of its soil was held by immigrants from England. In 1875, there was great dissatisfaction on account of the English rule, and Sir Garnet (now Lord) Wolseley was sent to adjust matters. He was succeeded as governor by Sir Henry Bulwer. During his administration the fear of the strength of the neighboring Zulus, under Cetewayo, became so great that Sir Bartle Frere, high commissioner for South Africa, against the protests of colonists and the governor, sent a message which precipitated the Zulu war, from the results of which Natal was long in recovering. The charter of the colony now in force was granted in 1893, and in 1897 the province of Zululand was annexed to Natal. The legislative authority resides in the crown, a legislative council, and a legislative assembly—the crown being represented by a governor, who appoints the ministry, and, with their advice, the members of the legislative council. The capital is Pietermaritzburg, situated inland about 50 miles northwest of Durban, the chief and almost only seaport. The colony (including Zululand) has an area of 35,000 square miles, with a seaboard of about 400 miles. In 1898, its population was 902,365, of which 787,574 were Kaffirs, the remainder being Europeans or Indians. The population of the capital is about 25,000, and of Durban about 40,000. Its products include sugar, maize, wheat, oats and other cereals and green crops—the chief exports being wool, hides and skins, coal, gold, bark, sugar, and Angora hair. The coal fields of the colony are known to be extensive, and are now in direct communication with the seaport. Portuguese East Africa, and the Transvaal colony (separated by the Drakensberg mountains) border Natal on the north, Orange River Colony and Basutoland on the west, and Cape Colony on the southwest. The colony in the main is fertile, and is possessed of a salubrious climate. Winter in South Africa begins in April and ends in September.

As the result of the Boer war between Britain and the Transvaal and the late Orange Free State, Natal, in October, 1899, became at once the theatre of strife. See BOER WAR.

Nat'chez, Miss., an old-settled city, capital of Adams county, on the Mississippi river, in the rich cotton belt of the state, 90 miles southwest of Jackson, and 280 northwest of New Orleans. It is connected by a bridge across the river with Vidalia, La., and is served by the New Orleans and Northwest, and by the Yazoo and Mississippi Valley, railroads. The town mainly lies on the banks of the river; while the public buildings and residences are situated chiefly on a bluff above. It handles cotton largely, and has a number of factories, mills, steam-ginneries, etc. Population 12,210.

Na'tional Debt is the debt of a nation or government contracted by their legislative representatives. In early times these were comparatively small, because the government, as well as the individual, had to give security for the indebtedness; but since the commencement of the present system of banking and the ability of governments to issue interest-bearing evidences of indebtedness in the shape of bonds, the national debts have become in many cases, as for instance, that of France, quite enormous. Regarding the origin of these vast obligations, the most prolific cause is the wars in which the different nations have from time to time engaged; thus, the Civil war added about $2,500,000,000 to the national debt of the United States. Of late, however, the governments have borrowed

money for different public purposes, such as building railroads, telegraph lines, and equipping armies and navies. The present system of securing the national debt is by the issue of bonds, bearing a stated rate of interest, payable quarterly, and maturing or becoming due at a certain date. The debt of the United States is in part secured in this way and in part by the issue by the government of greenbacks or paper currency, actually nothing more or less than promissory notes, due upon demand, at presentation at the United States treasury. The method adopted in the United States for the payment of the debt is by the taxation of spirits, whiskey, tobacco, and butterine, and charging certain amounts for the traffic in these articles, and by the levy of a tax or tariff on articles imported into the country. The greatest amount ever owed by this government was $2,773,236,173 in 1866, directly after the Civil war, but this was reduced to $798,137,603.28 in 1892. The debt (Dec. 31, 1900) of the United States was a trifle over a thousand million dollars — that is, the interest-bearing debt; the debt bearing no interest, represented chiefly by United States bank notes, amounted at the same date to 385 million dollars. Besides this national indebtedness, some 750 millions represents treasury notes and certificates; but this sum is offset by cash in the treasury. The indebtedness of the chief nations in 1900 was: Great Britain (funded and unfunded debt), £3,100,000,000; France, total debt, including interest and annuities, £6,260,000,000; Germany, total debt (bearing interest at 3% and 3½%), less war treasury fund, $555,000,000; Russia, total debt, including that incurred for state railroads, $3,575,000,000; Italy, $2,580,000,000; Austria-Hungary, consolidated and floating debt, $1,250,000,000; China, outstanding foreign debt (raised chiefly to meet expenses connected with the war with Japan), $270,000,000.

National (*nash'un-al*) **Park.** See YOSEMITE.

Nat'ural Bridge, The, an arch of limestone which spans a small river in Virginia, one of the features of the landscape in the far-famed Shenandoah valley. It stands among cascades and caverns and deep pine woods, a mighty arch of a single stone. It is 215½ feet in height, 100 feet wide, and has a span of 80 feet. It occurs west of the Blue Ridge, and 14 miles from Lexington, Va.

Nat'ural Gas, the name applied to combustible gas which escapes from beneath the soil in such quantities that it may be used for fuel or illuminating purposes. In its natural state, the gas occurs in porous sedimentary rocks, and when proper openings are made, it rises to the surface. Wells are drilled for gas, just as for oil or water. Natural gas is the product of decay or distillation of organic matter buried in sand, mud, etc. By its burial, the organic matter is shut off from contact with the air, and hence the gases arising from its deposition and distillation are not completely oxidized. Organic matter is now being imbedded in sands and muds which are in process of deposition on lake and sea bottoms. Under proper conditions this might ultimately give rise to gas. Natural gas is really a mixture of several gases in variable proportions; among them marsh gas (CH_4) and hydrogen are usually most abundant.

Natural gas is widely distributed. It is extensively utilized in Indiana, Pennsylvania, Ohio, West Virginia, New York, and California; and to a limited, but still important extent, in Kansas and Kentucky; and to a slight extent in Utah, Colorado, Illinois, Missouri, and Texas. The commercial value of the gas consumed in the United States in 1898 was more than $15,000,000. The flow of gas from a well is usually of short duration. It may last for a few months or even years, but not indefinitely. The popular notion that the withdrawal of gas from beneath the surface leads to earthquakes, etc., is wholly without foundation. The gas occurs in the pores of rock, and its escape does not make the rock less firm or substantial. Gas occurs in rock formations of various ages. Some of it comes from rocks as old as the Ordovician (see GEOLOGY), and some of it from formations as young as the Tertiary, or even Pleistocene. Natural gas and petroleum are probably associated in origin, as they often are in their distribution.

Nat'uraliza'tion, the process by which a person born in another country becomes possessed of the privileges and is placed under the obligations of a citizen of the country in which he resides. It involves the renunciation of allegiance to one country and the adoption of the other. It was not until 1870 that Great Britain recognized such a renunciation by any of its subjects, and before that time would charge with treason any person having so done, if he bore arms against Britain; but in that year a treaty was made by which Englishmen who had been naturalized in this country, were treated as citizens of the United States and vice versa. The conditions upon which one can become naturalized differ materially in various countries. In the United States, a foreigner must make oath of his intention to become a citizen. If at this time he has resided three years in the United States, he receives what are known as his "first papers." Then, after the lapse of two years, upon a sworn substantiation of his good morals, a five years' residence and a renunciation of all allegiance to any and all foreign monarchs or potentates and all titles of nobility, before any one of the superior, district, or circuit courts, he becomes a citizen of the United States. In Great Britain, five years' residence or service under the crown entitles a foreigner to a certificate of naturalization, procurable from one of the principal

secretaries of state. The British colonies make their own rules for becoming a citizen, applicable, however, to only the colony in which they are made. In France, a foreigner, after having obtained permission to reside, may receive a certificate of declaration of intention after three years' residence, and by the French naturalization act of 1889, may become naturalized after ten years' residence without any preliminaries. In Germany, an applicant must show that the laws of his country allow him to renounce it, that he is residing in Germany, leading a respectable life, and has a means of livelihood; then the higher administrative power issues his papers. In all countries a married woman is considered as subject to the country in which her husband is naturalized, and a father's naturalization carries with it that of his minor children. See *Nationality*, by Chief-Justice Cockburn.

Nau'gatuck, Conn., a town in New Haven county, on the Naugatuck river, 5 miles south of Waterbury, and 15 miles northwest of New Haven. It is served by the New York, New Haven, and Hartford railroads. Its manufactories receive their water-power largely from the river. These include rubber and woolen goods factories, buttons, boots and shoes, cutlery establishments, and agricultural implement works, etc. Population 10,541.

Nautilus (*naw'ti-lŭs*), a mollusk having a chambered shell and belonging to the class Cephalopoda. It is the sole living representative of one order of that class, possessing four gills while the other cephalopods have only two. Its shell is not uncommon on the shores of warm seas, but the animal is not often found inhabiting the shell. It creeps about the bottom, and the floating shell is the result of storms. It is called both pearly nautilus and chambered nautilus. The former name comes from the pearly appearance of the innermost layer of the shell, and the latter, from the circumstance that the spiral shell is divided into a set of chambers. The animal lives in the outermost one. When very young it lives in a small shell shaped like a horn. As it grows, it draws the body forward and secretes a pearly partition just back of it, and adds to the margin of the opening of the shell; this is repeated, and a set of chambers results. The animal has a plump body connected with the apex of the shell by a sort of cord, which passes through the center of each partition wall. There are large eyes. The head is surrounded by a number of arms or tentacles, which do not possess suckers like the squid or devilfish, to which the nautilus is related. The paper nautilus, or argonaut, is sometimes confused with the true nautilus. It, however, belongs to another division of the cephalopods having only two gills. The shell of this animal is secreted by the female only, as a case or cradle for the eggs, and is not a shell to protect the animal. In geological times there were huge chambered shells inhabited by animals like the nautilus. These shells were straight instead of being coiled and are well known under the name orthoceratites. See Woodward's *Manual of the Mollusca* (fourth ed. 1880) and Holmes' poem, *The Chambered Nautilus*.

NAUTILUS SHOWN IN SECTION.

Navajo (*năv'vă-hō*) **Indians**, a tribe of American Indians belonging to the Athabascan or Tinney stock. They call themselves Yutahenne. They occupy a fine reservation in Arizona and New Mexico, and are in a good degree civilized. They carry on farming, though their utensils are mostly hoes and primitive implements, such as sharp sticks. Their leading crops are corn, beans, melons, pumpkins, and wheat, and they have orchards of peaches and apricots. Their reserve includes 5,468,160 acres of land, and about 15,000 of this is under cultivation. They have 40,000 horses, 500 mules, 1,200 neat cattle, and 1,100,000 sheep and goats, besides many burros and asses. They number about 17,000. While not given to fighting, they have much spirit in defending their rights. There is a school on their reservation, but the Indians do not compel their children to attend it. The houses are rude booths or huts, built of sticks, sods, or bushes. As they never enter a house where one has died, when a death occurs, the corpse is buried by pulling out the prop sticks and letting the sods and sticks fall on it. The Navajos are strong and well built, and are expert horsemen and herders.

Na'val Acad'emy of the United States, The, a school for the training of naval cadets under the supervision and control of the government, was founded by federal authority in 1845, and opened for the reception of students in October of that year. It is located at Annapolis, Md., on the Severn river, and occupies the site of old Fort Severn. Previous to this date there had been a school for the training of midshipmen in connection with the Naval asylum at Philadelphia, Pa. When the academy was placed at Annapolis, James K. Polk was President and George Bancroft was secretary of the navy. Commander Franklin Buchanan was the first superintendent. The institution was reorganized in 1850, and again in 1851, important changes taking place at each of these dates. The grounds with the buildings occupy a site of fifty acres, while outside the walls 100 acres additional belong to the park. Cadets are appointed by members of the house of representatives, each member being allowed one cadet graduate every six years. By appointment of the President one

cadet is allowed the District of Columbia, and ten from the country at large. Candidates are required to pass an examination (after appointment) as to their physical soundness, their knowledge of spelling, grammar, geography, history of the United States, arithmetic, and algebra as far as equations of the first degree. They must be not less than fifteen years of age and not over twenty. If admitted they must make a deposit of $200 to cover the cost of personal outfit; but their expenses of travel from their homes to Annapolis are refunded to them, and they receive $500 a year, their subsistence, clothing, and certain other expenses being, however, required of them. The course has been changed several times, but, as it now stands, all cadets must pass four years at the academy and two years at sea. During the first three years of their residence at the academy cadets are instructed in English studies, history, French, Spanish, or German, algebra, geometry, trigonometry, astronomy, physics, chemistry, mechanical drawing, and navigation. The studies of the fourth year are varied according to the special line of duty to which the cadet devotes himself, such as naval construction, gunnery, infantry tactics, international law, etc. The number of cadets at the academy varies from 225 to 265, the average graduating class being about 50.

Na'val Observ'atory of the United States, The, an institution of the federal government, is located at Georgetown, District of Columbia, under the superintendence of the bureau of navigation. It was established in 1842, and then called the Depot for Naval Charts and Instruments. The *Nautical Almanac*, issued yearly, is compiled at this place. The present equipment of this observatory is probably surpassed by no other in the world for the performance of the important functions intrusted to it.

Navarino (*nă-vă-rē'nō*) (officially **Pylos**), is a town of 2,000 inhabitants on the southwest coast of Morea, in Greece, and the best harbor in Greece. In 425 B. C., the great battle between the Athenians, under Cleon, and the Spartans, in which the Spartans were defeated, occurred in the bay of Navarino; and in October 20, 1827, the combined British, French, and Russian fleets completely annihilated the Turkish and Egyptian navies at the same place.

Navarro (*nă-vär'rō*), **Mary Antoinette (Anderson)**, an American actress, was born at Sacramento, Cal., July 28, 1859. She was, as a child, educated in a convent, but began studying for the stage when only thirteen years of age, and made her appearance in Louisville, Ky., her home at the time, as "Juliet," in *Romeo and Juliet*, when in her seventeenth year. The next year she began playing in New York, and was from the first received with great favor. Three years later she visited Europe for study and recreation. In 1883, she made her début in London, and was received with enthusiasm from the first. While in London she produced the *Winter's Tale*, which ran through an entire season without change. Transferring play, scenery, and assistants to New York, she brought out the same play there with equal success. She was married at Hampstead, England, June 18, 1890, to Antonio F. de Navarro, son of a wealthy Mexican resident of New York city, and she then withdrew from the stage. Mrs. Navarro published, in 1896, a book of reminiscences entitled *A Few Memories*, which exhibited no little ability and which sold largely.

Naviga'tion is the art of conducting a ship at sea from port to port. There are two methods of determining the situation of a ship at sea. One method consists in finding the latitude and longitude by astronomical observations, the other method consists in noting the ship's direction and the distance traveled each day, and computing by trigonometry the position of the ship. In the latter method the two instruments used are the mariner's compass to determine the direction, and the log line to determine the rate of travel. Winds and currents and variations of the compass needle render this method untrustworthy. The most accurate method of determining the position of a vessel is by astronomical observations. Every ship is provided with at least one accurate chronometer. Then, by noting accurately the time when the sun reaches its highest altitude, the true noon is found, and from difference in time as noted from the chronometer, the longitude can be calculated. Similarly, the latitude may be calculated by observation with the sextant of the sun's altitude in the heavens at noon. When the sun is obscured at noon other astronomical methods are resorted to, such as observations at other hours and on other heavenly bodies. No one method is ever relied on solely, but every observation possible is made to check up others. Currents and temperatures of the sea are made, depths are noted by the lead, and when land is approached, lighthouses and light-ships are carefully watched for.

Na'vy. The navy of any country is its fighting force on the sea, and bears the same relation thereto as does the army as a land-force. The ancient method of naval warfare was in great part the practice of driving a beaked vessel against another with great force. This survives to the present day in the use of *rams*. The ancient boats were propelled with force and precision by oars, arranged in one, two, or three tiers, and manned by either standing or sitting sailors. A three-banked vessel was called a trireme. The Persians, Carthaginians, Phœnicians, and Greeks are known to have had such fleets as early as the 7th century B. C. The first sea fight recorded is the one between the

Corinthians and their colonists of Corcyra, in 664 B. C., and the first naval battle of note was that of Salamis, when the Greeks, under Themistocles, with 336 triremes, defeated the Persians with 1,200 triremes and 3,000 smaller vessels. Grecian power over the sea lasted until the lowering of the Athenian standard in the Syracusan war, in 414 B. C., and Carthage became queen of the seas until in turn conquered by Rome. Then the northern peoples and Moors introduced swift-sailing vessels, which led to the building of such fleets by Venice, Genoa, Pisa, Aragon, the Knights of Malta, and Turkey on the Mediterranean, and by England and France on the seaboard. Toward the 16th century, the Turkish fleet was the most powerful on the Mediterranean, and the Christian powers then formed a combination for defense. The battle of Lepanto, in which the Turkish power was temporarily broken, was fought in 1571. The united fleets comprised 206 vessels, and the Turkish 240, of which 224 were either sunk or captured, while 30,000 Turks were killed and 15,000 Christian galley slaves liberated. Toward the close of the 16th and 17th centuries, naval power was divided between the English, French, Spanish, and Dutch.

The modern navy dates from the 16th century, when, in 1588, the English fleet destroyed the Spanish Armada, and by slow steps in conquering the French and Dutch, became the foremost maritime power of the world. The first naval ship to be protected by iron was launched at Toulon in 1859 and named *La Gloire*. From this were patterned the subsequent armor-clad vessels, with improvements from time to time. The construction of the American navy dates from the war of independence, and in 1812 and 1814 proved a worthy foe of England on the seas. Thereafter it was in a measure neglected until the Civil war, when the construction of the armored *Monitor* changed the type of the warships of the future. Since 1887, a new navy has been built. In place of the old wooden vessels it is composed of powerful steel steamers, capable of high speed, and mounted with batteries of powerful modern guns. The expenditure on the naval establishment of the United States for the fiscal year 1901 was sixty million dollars. This large sum includes, besides disbursements in the maintenance of the fleet and the national defense, expenditures for the construction and armament of new vessels of such a formidable type as the great battleships, the new *Maine*, *Oregon*, *Illinois*, *Kentucky*, *Iowa*, *Kearsarge*; the first and second-class cruisers, such as the *Brooklyn*, *New York*, *Baltimore*, *California;* the double turret monitors and harbor-defense vessels, of which the *Puritan*, *Arkansas*, *Connecticut*, are fine examples; besides armored rams, gunboats, and torpedo-boat destroyers. The effective navy of the United States, in 1901, consisted of 10 battleships, besides six under construction, 8 coast-defense ships, 21 cruisers, 20 gunboats, 26 torpedo boats, and 10 torpedo-boat destroyers, in addition to a number, in the different classes, in the shipyards in various stages of construction. The more formidable vessels of the fleet have a displacement of 12,500 tons, engines of 16,000 to 20,000 horse-power, and a speed of 18 knots. The fleet comprises the battleships, which are practically floating forts, heavily armored, but capable of high speed; the cruisers, less heavily armored, but of greater speed; the double-turreted monitors for harbor defense, besides the large number of single-turreted monitors, gunboats, and torpedo-boats. The destructive power of modern ships and armament, when fought by brave and skillful sailors, was shown in the annihilation of the Spanish fleets in Manila bay and off Santiago de Cuba, by the Americans under Commodore Dewey and Admiral Sampson. Congress has authorized the construction of additional battleships, cruisers, and torpedo-boats, so that the strength of the American navy will soon be further increased. The money expenditure on the new United States navy in the past sixteen years, for construction, equipment, and repair, has been about 160 million dollars. Of existing navies, that of England is by far the most powerful, Russia and Germany following her in the number and gross tonnage of their battleships. See J. W. King's *Warships and Navies of the World;* Lieut. F. H. Vesey's (U. S. N.) *Navies of the World;* and Mahan on *Sea Power*.

Naz'areth, the home of Jesus, anciently in Galilee, is still a small and flourishing town in Palestine. It is built partly on rocky ridges in a hilly country. It is not mentioned in the Old Testament, and in the early part of the Christian era was almost forgotten, the first pilgrimage to it taking place in the 6th century. The town contains a Latin convent, built on the supposed scene of the annunciation, while the Greeks have also built a commemorative chapel. There is also a Latin chapel, supposedly built over the workshop of Joseph, and a temple of the Table of Christ, containing the table from which the twelve apostles ate the last supper. The Virgin's well is just outside the town limits. The place has long been famed for the beauty of its women. The population is estimated at from 4,000 to 10,000.

Ne'bo, Mount, the highest point of the range of mountains to the east of Jordan, in the land of Moab. It was from its summit that Moses had his "Pisgah view" of Palestine. An ancient rude altar, probably as old as the time of the Amorites, was discovered here by Captain Conder in 1881.

Nebras'ka, one of the central states of the United States (one-half again as large as New York state), is bounded on the north by

South Dakota, on the east by the Missouri river, on the south by Kansas, and on the west by Wyoming. The country's surface is rolling prairie, level in the east and south, but in the west and north covered by the sand hills and an extension of the Bad Lands. The altitude of the western portion is 6,000 feet, falling to 2,000 feet at the east; consequently its principal rivers, the Platte, Niobrara, and Republican, flow in an easterly direction. Probably over one-fifth of its area (land surface) of 76,840 square miles, consists of improved farms, while the soil is mainly a black loam. The principal agricultural production is maize, but of late a great staple has arisen in the cultivation of the sugar beet. The manufactures are confined to the eastern and southern portions of the state, but although they are large and numerous, farming is the state's wealth. The state has a number of universities, colleges, and academies, and over 6,000 public schools. The University of Nebraska, at Lincoln, founded in 1869 (opened in 1871), has had a prosperous growth. Dr. E. Benjamin Andrews became its chancellor in 1900. The other chief colleges of the state are the University of Omaha (Presbyterian) at Bellevue; Doane college (Congregational) at Crete; Grand Island college (Baptist); Hastings college (Presbyterian); Gates college (Congregational) at Neligh; Nebraska Wesleyan university at Lincoln, and Creighton university at Omaha. Its principal cities are Omaha, Lincoln the capital, Beatrice, Hastings, and Nebraska City. Its population in 1900 was 1,068,539. The state was originally a part of the Louisiana Purchase and of the Northwest Territory. It became a territory in 1854, extending north to British America and west to the Rocky mountains, but before its admission as a state, in 1867, parts of it were taken to form Colorado, Idaho, and Dakota.

Nebras'ka City, the capital of Otoe county, Neb., lies on the west bank of the Missouri, 74 miles below Omaha. It is the seat of Nebraska college, and of the Academy of the Annunciation; it possesses a grain elevator and several manufactories. Population 7,380.

Nebuchadnezzar (*neb'u-kad-nĕz'er*), the most illustrious of Babylonian kings, was the son of Nabopolassar, the general of the Babylonian garrison at the time the Assyrian empire fell to pieces after the death of Assurbani-pal. The Babylonians then threw off the hated yoke of Assyria, and Nabopolassar was proclaimed king of Babylonia, in 625 B.C. Nebuchadnezzar succeeded him in 604 B. C., reigning 43 years, and was one of the greatest sovereigns who ever ruled over an ancient empire. He recovered the long-lost provinces of the kingdom, rebuilt palaces and temples, as well as the city of Babylon, captured and destroyed Jerusalem, taking the Jews into captivity. It is an astonishing fact that not a single mound has been opened by explorers in Babylonia, which did not contain bricks, cylinders, and tablets inscribed with his name.

Nebulæ (*nĕb'ū-lē*), are celestial bodies resembling, in appearance, small patches of white cloud. Hence the name, which is merely the Latin word for *small cloud*. Many thousands of these nebulæ have been measured and catalogued, but with the exception of two or three they are all invisible to the naked eye. Until 1864 — five years after the invention of the spectroscope by Kirchhoff and Bunsen — nebulæ were considered to be very distant star clusters, or clusters made up of stars so small as not to be resolvable by any existing telescope. But in the year mentioned Sir William Huggins examined a number of nebulæ with the spectroscope and found that they were not stars, but bodies composed of luminous gas, giving a spectrum of some six or seven bright lines. Two of these lines are fairly bright and are due, as has been proved by Keeler at the Lick observatory, to a substance not yet discovered on the earth. The brightest of all nebulæ is the one in the girdle of Andromeda; the one in the sword-handle of Orion can also be seen at times by the naked eye.

Planetary Nebulæ is the name given to those which show a more or less well-defined disc. It is not impossible that nebulæ are merely stars in their early stages of development, later to pass through the phases of *planetary nebulæ* and *nebulous stars*. See Scheiner's *Astronomical Spectroscopy*, translated by Frost.

Neb'ular Hypoth'esis is a theory advanced by three different men, Swedenborg (1688–1772), Kant (1724–1804), and Laplace (1749–1827), to account for the observed facts of planetary motion. The more important phenomena to be accounted for are as follows:

1. The orbits of all the planets are nearly circular and lie all nearly in one plane.

2. The direction of revolution about the sun is the same for all planets.

3. Except in the case of Uranus and Neptune, the direction of rotation of the planet on its axis is the same as its direction of revolution.

4. The larger planets rotate (not revolve) more rapidly.

5. The plane of rotation is not very different from the plane of the orbit.

6. The satellites generally have a direction of revolution which coincides with that of the planet's rotation.

To explain this rather orderly state of affairs it was supposed that the matter now constituting this solar system was at some earlier date in its existence distributed in the form of an immense nebula; and that as this nebula condensed, and therefore increased its rate of rotation (while preserving a constant moment of momentum) the centrifugal force became so great that some of the outer portions of the nebula were set free. That is,

the centrifugal force reached a point where it balanced the attraction of the rest of the nebula. The portions thus set free, whether as a ring or as a "hump," condensed still farther and formed the earlier planets. As the concentration of the original nebula proceeded, the rate of rotation kept on increasing and again "threw off" or set free other planets. So also with the planets themselves; as they became more and more compact, their rate of rotation increased sufficiently for them to set free their satellites.

In a general way this hypothesis explains in a very satisfactory manner the six facts enumerated above. With later modifications it explains even many of the anomalies of the solar system. See article LAPLACE.

For recent criticism of this hypothesis see article by Moulton in *Astrophysical Journal*, Vol. II. (1900).

Neck'ar, a river in Germany, flowing through Würtemberg and Baden; it is one of the largest tributaries of the Rhine, rises on the eastern slope of the Black Forest, and pursues a winding course for 250 miles until it enters the Rhine at Mannheim. It is navigable for about half its lower length. Tübingen, Heidelberg, Heilbronn, and Cannstatt are on its banks.

Neck'er, Jacques, a financier and minister of France, was born at Geneva, Sept. 30, 1732. At the age of fifteen he went to Paris as a bank clerk, and in 1762 founded the London and Paris Bank of Thellusson and Necker. He entered public life as a syndic of the French East India company and minister of the republic of Geneva at Paris, and about this time married. In 1773, he received the French academy prize for a eulogy on Colbert, and won great recognition by his *Essai sur le Commerce des Grains* in 1775. This was an answer to the free trade arguments of Turgot. After having loaned some money to the government, he was made director of the treasury in 1776, and director-general of finance in 1777. For five years he labored to improve the financial condition of France by readjusting the taxes, establishing state-guaranteed annuities and the present system of government pawnshops. His methods displeased the queen, however, and his publication of the *Compte Rendu*, a statement of the financial condition of France, in 1781, was made the cause of his dismissal. He thereupon withdrew to Geneva, but returned in 1787 and defended his *Compte Rendu*, for which he was banished from Paris. He was recalled to his office in September, 1788, but while winning popularity through recommending the summoning of the states-general, he proved wholly incompetent during the storms of the revolution. He declined the aid of Lafayette and Mirabeau, and on July 11, 1789, was ordered to leave France, but after the fall of the Bastille, three days later, he was recalled, only to resign voluntarily in September, 1790. He retired to his estate near Geneva, and died there on April 9, 1804. See *The Private Life of M. Necker*, by his daughter.

Nec'tar, the name given by most of the Greek and Roman poets to the drink of the gods. Homer describes it as of a red color, and says that its continued use was supposed to insure immortality. The sprinkling with nectar was supposed to confer perpetual youth, and it was used, in figure of speech, as meaning everything delightful and pleasant to the taste.

Nee'dle. The sewing needle must be one of the oldest implements used by man. Bone needles with eyes are found in the reindeer caves of France, and on the sites of the prehistoric lake dwellings of central Europe have been found many "eyed" needles of bone and of bronze, but only one of iron. Ancient bronze needles, 3½ inches long, have been found in Egypt, and there are surgeon's needles and thimbles which have been used in sewing, with ordinary needles recovered from Pompeii in the Naples museum. Savage races use needles of various materials, such as bone, ivory, wood, and metal.

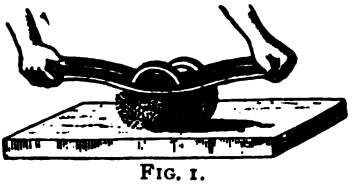


FIG. 1.

Steel needles were first made in Nuremberg in 1370, but the manufacture was not of much importance until about 1650. The early made needles were all square-eyed. Redditch, near Birmingham, is the seat of the needle manufacture in Great Britain, and great improvements have been made by the use of automatic machines and other new mechanical appliances. There are about twenty-two processes now used in the making of needles. First, fine steel wire is cut into double lengths; these are raised to a dull red heat and placed in loose bundles inside iron rings, to be straightened by rolling each bundle backward and forward on a face plate with a slightly curved bar (Fig. 1), through which the rings project. Next, the wires are pointed at both ends and then stamped in the middle, so as to produce the flat part of the eyes and the mark for the holes (Fig. 2); two oval holes are then punched by a vertical, belt-driven punching machine.

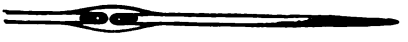


FIG. 2.

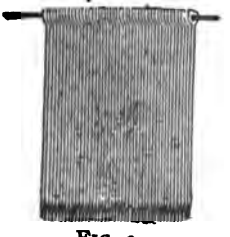


FIG. 3.

After being eyed the double needles, joined at the heads by thin fins, are "spitted" through their eyes on two wires flattened at one end so as to retain them. The burr made by the punch and die is now filed away, and after being broken in two between the heads and filed smooth, a row of single needles is left on each spit, as shown in Fig. 3. Next they are tempered by heating and dipping in oil, then polished and cleaned and sorted. It is estimated that 50,000,000 needles are made weekly in the Redditch district.

Nee'dle Gun. See RIFLE.

Ne'groes, a name given to the races inhabiting Africa, though it does not include all the inhabitants of that continent. The inhabitants of northern Africa, such as the Abyssinians, Nubians, and also the Hottentots of the south, do not belong to the negro race. The physical characteristics of the true negro are black skin, woolly hair, flat nose, and thick lips. Their skin is soft, and in the infant is a dull red, becoming black very soon. The negroes of the Guinea coast, who are rude savages, have a deep-black color and ugly features. Other tribes of the interior are tall and well formed, warlike, and have some ingenuity in making implements from iron. The skull of the negro is long and narrow, with low forehead, prominent jaws, and retreating chin. As a rule, they are of a low order of intelligence, mechanical in their work, but capable of great endurance. They are of a less nervous disposition than whites, more frequently color-blind, have smaller lungs and larger livers. The negro has long been a prey to the slave traffic, being captured in large numbers, and sold as slaves in other countries. The first slaves were brought to the United States in 1620, and this traffic was not discontinued until 1794, when it was prohibited by act of congress. The Spaniards began the trade, and King James and Queen Elizabeth both issued patents to companies. After 1794, and up to 1840, the trade was confined mostly from the African coast to the West Indies and Brazil. The coast of Guinea was the largest slave market, but inasmuch as they sold none of their own people but relied on those captured in war or by strategem, most of the slaves sent to the United States were of the pure negro type of the interior; while most of those taken to Brazil and the West Indies were closely allied to the Kaffir and Zulu stock of the east coast. The mortality among the negroes is greater than the whites, attributed in the south much to the fact of their low condition and inattention to the laws of health, in the north to their inability to withstand the cold and variable weather, as the diseases from which they suffer are mostly those of the respiratory organs. Therefore the publication, at frequent intervals, of accounts of long-lived negroes may be ascribed to the ignorance of their ages, and not to any exceptional tenacity of life.

In disposition the negro is, as a rule, cheerful and peaceable, unconcerned for the future, inclined to live in colonies, and is of emotionally religious instincts. Common among them even to the present day is the exercise of a certain form of witchcraft, called *Voodooism*, prosecuted by means of charms, philters, and fetiches.

The African negroes are quite ingenious in weaving mats and cloth and in the making of baskets from grasses; also, in constructing their huts and in making various utensils and implements for household use. They all acknowledge a supreme power, and are much given to a belief in witchcraft, charms, and spells. They have wooden images, which they think have power to drive away evil spirits, and to protect them from sickness and witchcraft. They are fond of music, and make various musical instruments of simple and rude character. Among the negroes in this country many become skillful in the use of musical instruments, especially the violin and the banjo. Since the emancipation of the slaves in this country, many individuals of the race have developed an ambition for education and the accumulation of property. In their education and elevation as a race much has recently been done for them by Booker T. Washington, himself a man of color, at the Tuskagee Normal and Iudustrial institute, of which he has been principal since 1881.

Nehemi'ah, who was a leader of the Jews after the exile, was a Jew holding the office of cupbearer to Artaxerxes when he heard, in some way unknown, of the unprosperous condition of Jerusalem. In the following year (444 B. C.), he obtained leave of absence and power to act as governor extraordinary of Judæa, and arriving at the city caused its walls to be rebuilt, enlarged the population by drafts upon surrounding districts, and brought back the Levites who had been forced to leave. On his second visit, twelve years later, he began new reforms, notably the movement against mixed marriages, the cleansing of the temple, a strict law of Sabbath observance, and a provision for the maintenance of the temple and priests. The Book of Nehemiah originally formed the closing chapters of the undivided work, Chronicles, Ezra, Nehemiah, containing the memoirs of Ezra and Nehemiah.

Nel'son, Horatio, Viscount, a celebrated English admiral, was born Sept. 29, 1758, at Burnham-Thorpe, in Norfolk, England. He entered the navy in 1770, and served with distinction for many years, earning one promotion after another. But on Aug. 1-2, 1798, he gained the brilliant victory, in the harbor of Abukir, over the French in the famous "Battle of the Nile," which covered him with glory. Never in recent times had there been a victory so complete — so overwhelming; and when Nelson, with his shattered fleet, returned to Naples, he was the object of an

enthusiastic adoration which knew no bounds. He was raised to the peerage, with the title of Baron Nelson of the Nile; parliament voted him a pension of $10,000 a year, and the East India company awarded him a sum of $50,000. Turkey and Russia sent him costly presents, and the king of Naples gave him the title of the duke of Bronté, in Sicily, with an estate worth $15,000 a year. On Jan. 1, 1801, he was promoted to be vice-admiral, and later, as viscount, he conducted the defense of the coast of England against the French. On the renewal of the war with France and Spain, in 1805, he was sent out to the Mediterranean in command of the English fleet, against the French vice-admiral, Villeneuve. What Nelson wanted was not merely an honorable victory gained by an inferior fleet, but the annihilation of the enemy. At daybreak on the 21st of October (1805), the two fleets met off Cape Trafalgar; deafening cheers broke from the British armament as the celebrated signal flew from the flagship, "England expects every man to do his duty"; and it is said that Villeneuve, as he heard the shout, exclaimed, "All is lost." The battle ended in a decisive victory of the English. The fleet of the allied enemies was totally destroyed, but Nelson, the greatest of England's commanders at sea, fell mortally wounded, having swept her foes from the ocean. Nelson's body was buried in a crypt of St. Paul's, London. A splendid monument has been erected to his memory in the cathedral. See Southey's *Life*, and *Nelson's Dispatches and Letters*, edited by Sir N. Harris Nicolas.

Nel'son River, a river in the northwest territories of the Canadian Dominion, which has its source in the north end of Lake Winnipeg, and flows 400 miles in a northeasterly direction into Hudson bay, discharging an immense volume of water. It is navigable for 127 miles from its mouth, but for only 70 or 80 miles for large steamers. Its chief feeder is the Saskatchewan, which empties into Lake Winnipeg.

Nel'son, William, an American general, was born at Maysville, Ky., in 1825. He entered the navy and in 1854 had attained the rank of commander, but at the outbreak of the Civil war he was transferred to the army, and in 1861 was appointed brigadier-general. He was in command of a division at Shiloh, in April, 1862. As the result of a private quarrel, he was killed by Gen. Jefferson C. Davis, at Louisville, Ky., Sept. 29, 1862.

Nem'esis, said, by Hesiod, to be the daughter of Night, was at first the embodiment of righteous moral feelings, or of the conscience. Later on, Nemesis was regarded as the power which balanced the fortunes of the people and taught them to reverence the immortal gods. From this was evolved the latest conception, that of the avenger of wrong. She was at first represented as a young virgin, and later as clothed in a tunic, sometimes with sword in hand and a wheel at her feet, or in a chariot drawn by griffins. Several fragments of Phidias' statue of Nemesis were discovered in 1890, in the famous temple of Nemesis at Rhamnus, Africa.

Ne'on. See ARGON.

Ne'pomuk, John of, the patron saint of Bohemia, a martyr of the seal of confession, was born near Pomuk about 1330, and after studying at the University of Prague, and taking holy orders, was appointed confessor to Sophia, wife of King Wenceslaus IV. For his refusal to reveal the confessions of the queen to the king, John was tortured, securely bound, and thrown into the river Moldau in March, 1383. He was canonized by Pope Benedict XIII. in 1729, and his memory, deeply cherished, is celebrated on May 16.

Nep'tune, the Roman god of the sea, was like all the other gods of mythology, merely a name. This was derived from Nethunus, the sea-god of the Etruscans. He is also identified with the Greek sea-god Poseidon. The figure of a bearded man standing in a shell drawn over the sea and holding a three-pronged spear, or trident, is his usual pictorial representation.

Nep'tune. See PLANETS.

Nerbud'da or **Narba'da,** an Indian river of about 800 miles, with a drainage of 36,400 square miles, rises on the Amorkantak plateau, 3,493 feet above sea level, and flows west through central provinces and the great channel between the Vindhya and Satpura mountains into the gulf of Cambay. It is navigable for only about 80 miles from its mouth. The Hindus consider it a sacred river and look upon a foot journey from mouth to source and back as a meritorious act.

Ne'ro, the last of the Cæsars and emperor of Rome from 54 to 68 A. D., was born at Antium, Dec. 15, 37. His mother became the wife of the Emperor Claudius, who adopted him, and on the emperor's death he was declared emperor by the Prætorian Guards instead of Claudius' own son, and this choice was ratified by the senate and provinces in 54. His reign, although opening well and moderately, soon became one of crime, debauchery, and tyranny. He caused Britannicus, Claudius' son, to be poisoned, brought about the murder of his own mother, and finally divorced and murdered his wife. All this was accompanied by wars and insurrections,—in 61 A. D. an uprising in Britain, which was suppressed, and in 62 the war with the Parthians and Armenia. In 64, a great fire destroyed nearly two-thirds of Rome, and many historians say that Nero applied the torch and sat far away admiring the scene. Nero thereupon used the sect of Christians as scapegoats, and had many of them put to death. Through the high-handed imposition

of taxes, he rebuilt Rome and erected the "golden house" for himself on the Palatine hill. A conspiracy against him in 65 failed and caused the death of Seneca and others. He kicked his second wife to death and afterward offered his hand to Antonia, the daughter of Claudius, who, upon refusing him, was put to death, as was also the husband of Statilia Messalina, whom he thereupon married. His inordinate vanity caused him to believe that he was everything brilliant, as is witnessed by his last words: "What an artist is lost in me!" In 68, the Prætorian Guards rose against him and in conjunction with the Gallic and Spanish legions, proclaimed Galba emperor. Thereupon Nero fled from Rome and was declared an enemy of his country, and to save himself from execution, he committed suicide June 9, 68. See W. Wolfe Capes' *Early Roman Empire*, and Merivale's *History of the Romans under the Empire.*

Nerves, the fibers of white nervous matter connecting the different parts of the body with the central nervous system. Two kinds of nervous tissue are recognized,—the white and gray. The white is composed of fibers, the gray is largely made of nerve cells located in centers. The nerves are merely conductors of the nervous impulses that arise within the nerve-cells. Nerves make their first appearance in the animal kingdom among the jellyfish as parts of the primitive nervous system. They are at first strands of protoplasm connected with the nerve-cells from which they grow. They become associated in bundles, bound together by connective tissue, and thus form the white cords that run amongst the muscles and other parts of the body. In the human body, there are twelve pairs of cranial nerves connected with the head, and thirty-one pairs of spinal nerves connected with the spinal cord. Those of the head are much more complex than those of the spinal cord, but they are believed to be derived from a simpler condition in which they were equivalent to them. They are now so much modified that it is difficult to understand them. The thirty-one pairs of spinal nerves come from two roots closely joined to the spinal cord. These are called sensory and motor roots, respectively, because those at the back contain sensory fibers and those in front motor fibers. Recent observations have established a great law in reference to the development of nerves, viz., the sensory fibers arise outside and grow into the central nervous system, and motor fibers start within the central nervous system and grow outward. This applies even to the highest developed sensory nerves—for example, the fibers of the optic nerve begin in the retina of the eye and grow toward the brain, instead of starting in the brain and growing outward to the eye. Besides sensory and motor fibers there are those that regulate the nutrition and the tone of organs, called trophic nerves, those that carry impulses which stimulate secretion, called secretory nerves, and some others. The twelve pairs of cranial nerves are as follows: The first pair connected with smell; the second pair with sight; the third, fourth, and sixth pairs are connected with muscles that move the eyeball. The fifth pair go to the teeth, tongue, and face, the seventh pair to the muscles of the face, the eighth pair to the ears, the ninth pair to the tongue, as nerves of taste, and to the muscles of the pharynx. The tenth pair (pneumogastric) are very important and widely distributed, going to the heart, lungs, stomach, and intestines. The eleventh pair supply certain muscles in the neck, and the twelfth pair form the muscles of the tongue. Besides all these, are nerves belonging to the sympathetic nervous system. The object of nerves is to connect the different parts of the body with the controlling nervous system. They are simply conductors and not originators of nervous impulses.

Nes'tor, the great Greek counselor of the Greeks, was born in Messenian Pylus, the son of Neleus and Chloris, and became the husband of Eurydice. In his youth he fought valiantly against the Arcadians, Epeans, and Centaurs, and in his older years was famed for his wisdom. He joined the war against Troy with sixty ships, and although an old man, remained through the war, returning to Pylus at its close and ruling as governor until his death.

Nestor'ians, a sect formed in the 5th century by the followers of Nestorius, patriarch of Constantinople in 428 A. D., but who was deposed in 431 because of his peculiar views as to the divine and human nature of Christ. After it was driven out of the Roman empire, the sect of Nestorians was extended into Persia, India, and even China. In Asia Minor, under Babæus, bishop of Seleucia (498–503), and his successor, the sect grew rapidly and produced many learned theologians, philosophers, and physicians, such as Hippocrates and Galen. Under the rule of the caliphs the Nestorians enjoyed toleration, and spread in Arabia, Syria, and Palestine. The Prester John of romance was a Christian of this color, and tradition has it that Mohammed learned what he knew of Christianity from a Nestorian monk. The sect reached the height of its prosperity in the middle of the 13th century, but after the persecutions of Tamerlane they dwindled away. They are now a poor and illiterate race numbering less than 70,000. Their chief seat is in Persia and in the mountains of Kurdistan.

Neth'erlands. See HOLLAND.

Net'tle, species of urtica, a genus containing about 30 species widely distributed. The best-known nettle is *U. dioica*, known as the "stinging nettle," which is a native of Eu-

rope and Asia, but has become extensively naturalized in the United States. It is densely beset with stinging hairs.

Neuchatel or **Neufchatel** (*nu'shă'tĕl'*), the chief town of the canton of Neuchâtel in Switzerland, is situated on the northwest shore of the lake of Neuchâtel, about 85 miles from Geneva, and is noted for its charitable, educational, and artistic institutions. It manufactures mainly watches, jewelry, lace, etc., but not the Neufchâtel cream cheese; this comes from a small Norman town called Neufchâtelen-Bray. Population 20,697.

Neuchatel', Lake of, is all that is left of the large body of water which at one time covered the whole lower valley of the Aar, in Western Switzerland. Its greatest dimensions are 25 miles long and 6 wide, and its area 92 square miles. It is fed by the Thièle and the Reuse, and drained by the Thièle through the lake of Bernice and thence into the Aar. Its elevation is 1,424 feet above sea level, and its northwestern shore is rich and cultivated, but the opposite side is barren and rocky. It has pleasing though not remarkable scenery, and is famous mostly for the discovery of the ancient remains of water dwellings in it. The capital city of the canton, Neuchâtel, is on its banks.

Neu'ville', Alphonse Marie de, a popular follower of the French school of battle-scene painters, was born at St. Omer, May 31, 1836. He studied under Delacroix and painted a series of pictures of the Crimean, Italian, and Mexican wars of France. In the war with Germany, he served in the ranks and painted the series from experience. He also excelled as an illustrator of books. Guizot's *History of France* is illustrated from his designs. He died at Paris, May 19, 1885.

Ne'va, a northern Russian river; rising in the southwest corner of Lake Ladoga, it passes through St. Petersburg and empties into the bay of Cronstadt, in the gulf of Finland. It drains lakes Ladoga, Onega, Ilmen, and others. Its total length is 40 miles and the width varies from 180 to 4,000 feet. It is frozen over for about five months in the year.

Neva'da, one of the Pacific states of the United States, lies between Idaho and Oregon on the north, and Utah and Arizona on the east, and California on the south and west. It is 500 miles long and 300 wide between its farthest points, and although the sixth largest of all the states and territories, it has the least population, 42,335 in 1900. The largest part of the state is included in the Great Basin, or what was at one time the bed of a large inland sea. Its land surface has an area of 109,740 square miles, that is, almost twice that of Illinois. This part is dry and barren, with the exception of the regions immediately around Walker, Humboldt, Carson, Pyramid, and other lakes, and is traversed by high mountains. The mean elevation of the state is about 4,000 feet. The chief industry is mining, enormous quantities of silver having been found in several regions in the state. Its principal river is the Humboldt, which is about 350 miles long. The dry atmosphere is clear in winter, but in summer is filled with small particles of alkaline dust. The rainfall is exceedingly light, therefore the vegetation is very scant though hardy. Silver was first discovered in 1859, and the state was separated from Utah in 1861, and admitted as a state in 1864. The principal cities are Carson City, the capital, Virginia City, Reno, and Gold Hill. About 9,500 Indians are still on the reservations in the state.

New Al'bany, an important manufacturing city of Indiana, county seat of Floyd county, is on the Ohio river, nearly opposite Louisville. It has extensive glass works, cotton, woolen, hosiery, flour, rail, planing and rolling-mills, stove foundries, and other industries. It has a college, and excellent public schools. Population 20,628.

New Bed'ford, a city and port of entry in Massachusetts, is in Bristol county, on the Acushnet estuary, 56 miles south of Boston. For a century prior to 1854, it was the principal whaling center of the world, sending out over 400 vessels and receiving 60,000 barrels of sperm, and 120,000 of whale oil annually. Since that year, however, manufactures have claimed its attention, and it now contains cotton mills of 500,000 spindles, foundries, oil refineries, drill, cordage, boot and shoe, flour, glass, and plated ware factories. It has many very handsome private residences, and a population of 62,442.

New Bright'on, a village and beach resort of New York, is on Staten island, six miles from New York city. It is a summer resort, containing, for the most part, only villas, but has also a paper factory and dye works. It has frequent water connection with New York, of which city (Greater New York) it is now a borough.

New Brit'ain, a manufacturing town of Connecticut, in Hartford county, has two large parks and contains the state armory and normal school. The city has manufactories of hardware, cutlery, locks, hosiery, jewelry, etc. Water is supplied from a reservoir of nearly 200 acres. Population 25,998.

New Bruns'wick, an eastern province of the Canadian Dominion, abuts on the gulf of St. Lawrence, having Nova Scotia on the east and the Gaspe peninsula of Quebec on the northwest, with the state of Maine for its southern neighbor. With its many bays and inlets, it has a coast line of over 400 miles in extent, on the Northumberland strait, on the gulf of St. Lawrence, and on the bay of Fundy. New Brunswick is famed for its fisheries and canneries, as well as for its

lucrative lumber trade and its considerable industry in ship-building. The country is well watered, notably by the St. John river, navigable from near its mouth (at low tide) for steamers for a distance of 90 miles to Fredericton, the capital; thence for 70 miles further to Woodstock. The other chief rivers are the Miramichi, the Restigouche, and the Richibucto. On the Miramichi are the towns of Newcastle and Chatham. The city of St. John, the chief seaport, lays claim, with its rival Halifax, to the commercial designation of "the Liverpool of Canada." Its site was known to De Monts and Champlain, who visited it in 1604, though it was not occupied until thirty years later. Here, in 1834, La Tour erected a trading fort, which for many years became the disputed possession of the rival governor of Acadia, and the scene of the heroism of the Lady De la Tour. The harbor also figures prominently in naval history, being the scene of many sharp engagements between English and French war-ships, and between the latter and the armed vessels of the spirited colonists of New England. After the Revolutionary war, to St. John came a British fleet bringing 5,000 "United Empire Loyalists," who had voluntarily exiled themselves, to live under the British flag. As late as 1862, British troops were in garrison here, during the excitement incident to the *Trent* affair, though they were then withdrawn, and St. John has since then taken to maritime and commercial, rather than to military, pursuits. Both the city, and some inland districts of the Province, have suffered heavily at various times from destructive fires. Fredericton, the capital, is a charming little town, a considerable social center, and the seat not only of the Provincial Legislature, but of the university of New Brunswick, whose charter dates from 1828. It is also attractive to sportsmen as a rallying point and base of supplies, for the fine fishing and hunting grounds of the upper St. John. The other chief towns are Moncton, Kent, Dorchester, and Bathurst. Population 331,093.

New Bruns'wick, the capital of Middlesex county, N. J., lies on the Raritan river at the head of the Delaware and Raritan canal. It contains many churches and Rutger's college (1771), observatory, agricultural college, and model farm. It manufactures great quantities of india rubber, also hosiery, lamps, needles, etc., and has iron and brass foundries. Population 20,006.

New Caledo'nia, a south Pacific island belonging to France, lies between the Fiji islands and the east coast of Queensland. It is about 240 miles long and 25 wide and has an area, with its dependencies, of 7,700 square miles. The ground is much broken by irregular mountain chains, but in the valleys it is fruitful, yielding cocoanut, maize, tobacco, etc. It has rich mineral resources in copper, cobalt, antimony, and chrome, and exports these, together with preserved meats, copra, and coffee to England, while it imports wines, flour, drapery, groceries, machinery, and coal. It has a population of 53,000, of whom 30,650 are native Kanaques, and 7,544 are convicts.

Newcastle, a manufacturing city of Pennsylvania located on the Shenango river, fifty miles northwest of Pittsburg. The production of steel is the principal industry. Large blast furnaces, rolling mills, tin plate, wire and nail mills furnish employment for thousands of workmen. Glass, brick, and paper are also manufactured. Population 28,339.

New Guin'ea (British), Governor, Geo. Ruthven Le-Hunte, C. M. G. British New Guinea comprises the southeastern part of the island of Papua, or New Guinea, lying directly north of Australia, and separated from it by Torres strait. The area of the entire island is computed to be 234,768 square miles; the British portion is 90,540 square miles, with a population of about 350,000. The island, next to Australia, is the largest in the world, though the native tribes have only of late been reduced to order. The German territory is known as *Kaiser Wilhelm's Land* and embraces some 70,000 square miles. *Dutch New Guinea* forms another section of the island, with an area of 151,790 square miles. The various districts annexed by European governments are administered as protectorates by resident governors. The country is believed to contain valuable timber; the coco and sago palms are plentiful, and sandalwood, ebony, rattans, gums, and other products are found. Gold is also found and to some extent worked. Trade with the British possession is confined to Queensland and New South Wales.

New Hamp'shire, one of the original thirteen states, is called the "Granite State," and lies south of Quebec, west of Maine, north of Massachusetts and east of the Connecticut river, and has an area of 9,305 square miles. The White mountains extend nearly its entire length and the principal peaks are Washington, Adams, Jefferson, Madison, and Monroe. The principal rivers are the Merrimac, which furnishes more power to cotton and woolen mills than any other river in the world, the Connecticut, and the Piscataqua. Hay, maize, oats, and potatoes are the chief products of a limited farming industry, but manufacturing is carried on to a great extent. The largest cities are Manchester, Dover, Concord, and Nashua. The state has ten counties, sends two members to congress and elects its governor every two years. New Hampshire was first settled at Dover and Portsmouth in 1623. At different periods it belonged to Massachusetts, but from 1741 to 1775 it was under a royal governor. It adopted a constitution in 1784 and in 1788 was the ninth state to ratify the national constitution. Population 411,588.

New Ha'ven, the largest seaport and city of Connecticut, stands at the head of New Haven bay. It has broad, shaded streets, public squares, parks and gardens, and handsome public buildings. It also contains Yale college, Sheffield Scientific school, and Hopkins Grammar school (1660). Its chief consequence is as a manufacturing town, having large works in hardware, wire, locks, clocks, cutlery, firearms, india rubber goods, carriages, furniture, paper, and matches. The city was settled by an English company in 1638 and was unconnected with Connecticut until 1662. It was incorporated as a town in 1665 and received a city charter in 1784. Until 1873 it was jointly the capital with Hartford. Population 108,027.

New Heb'rides, a chain of islands in Melanesia, west of Fiji and northeast of New Caledonia in the Western Pacific, running from northeast to southwest. There are over thirty islands in the group, but only about twenty are populated. All are of volcanic origin, and some still have active volcanoes upon them. The largest are: Espiritú Santo, 70 miles by 40; Malikolo, 56 by 20; Ambrym, 22 by 17; Sandwich, 30 by 15; Erromango, 30 by 22, and Tanna, 18 by 10. They are all high and well-wooded, and the moist, clear, and warm atmosphere allows the cultivation of tropical fruits and products, such as the yam, taro, banana, breadfruit, sugar cane, arrow-root, and cocoanut. The people, who belong to the Papuan and Polynesian races, are cannibals. The chain was discovered by the Portuguese, Quiros, in 1606, and explored by Captain Cook in 1773. They are claimed by the British and by the French, and for the protection of life and property are under the authority of a mixed commission of French and English naval officers, on Pacific stations. Population estimated at about 80,000.

New Jer'sey is one of the thirteen original states and lies south of New York, west of the Hudson river, Raritan bay, Staten Island sound and the Atlantic, north of Delaware bay, and east of the Delaware river. It is the fourth smallest state in the Union, and has an area (land surface) of 7,525 square miles. Some portions of the Appalachian system extend into the northern part of the state, but no elevations in the state, outside of these, exceed 1,500 feet in height. The central part of the state is rich and fertile, the total farm acreage being about 3,000,000, and the chief products corn, oats, wheat, rye, potatoes, hay, and cattle. Its mineral products are iron ore, limestone, zinc, and slate; and glass, pottery, machinery, leather, silk, and sugar are its manufactures. Its principal cities are Trenton (population 73,307), the capital; Newark, New Brunswick, Jersey City, Paterson, Hoboken, Bayonne, East Orange, Atlantic City, and Elizabeth. The Atlantic coast has many small towns which are frequented as summer resorts.

New Jersey does liberal things for education, her annual public school expenditure amounting to close upon $2,500,000. Besides her public school enrollment of 325,000, she maintained, in 1900, 90 high schools with 460 teachers and over 10,000 students. The state has also three normal schools, two schools of technology, and four colleges, besides Princeton university, with a faculty of 100, and a student body numbering close upon 1,300, including graduates of the year (1899–1900), and academic and scientific undergraduates. The university enjoys an annual income of $275,000, and has a present endowment of about $2,500,000.

The state was settled at Bergen, by the Dutch, in 1617. In 1623, some English built a fort on the site of Camden, but were driven away by the Swedes in 1638. In 1664, Charles II. granted the state to the duke of York, and by him to Lord Berkeley and Sir George Carteret, who sold it to some Quakers and William Penn. In 1702, it was returned to the crown, and from 1738 had its own royal governors. Population 1,883,669. See the *History of New Jersey*, by Raum.

New Lon'don, a seaport of Connecticut, lies on the right bank of the Thames, three miles from its mouth, has a courthouse, city hall, and custom house, and includes woolens, sewing silk, agricultural machinery, hardware, and crackers among its manufactures. It has a good harbor and many vessels engaged in sealing and fishing. The town was settled in 1645 and burned by Benedict Arnold in 1781. Population 17,548.

New Mex'ico, a southwestern territory of the United States, lies south of Colorado, west of Oklahoma and Texas, north of Texas and Mexico, and east of Arizona, and has an area (land surface) of 122,460 square miles. The state is traversed by the Rocky mountain system, many peaks of the Santa Fé, Las Vegas, Taos, and Sierra Madre ranges rising to 12,000 feet. The ranges are divided by deep cañons and ravines. The principal wealth consists in its minerals, copper and iron, found all through the state, and its coal-beds. Its rivers flow into the gulf of Mexico and west to the Pacific, the chief being the Rio Grande, Pecos, Little Colorado, San Juan, and Gila. The soil is fertile in the valleys, and cattle-raising is one of the main pursuits. When the Spaniards first settled at Santa Fé, they found people living in substantial houses built long before; but in 1822 the people seceded from Spanish rule, and in 1848 a part of the territory was acquired from Mexico by the treaty closing the war, and the rest by purchase and cession from Texas. The territory originally included Arizona and part of California and Colorado, but was given its present boundaries in December, 1850. Population 195,310, of which 100,000 are Mexicans and nearly 40,000 Indians.

New Orleans, the largest city of Louisiana, lies on both sides of the Mississippi, about 107 miles from its mouth, and derives its name of Crescent City from the shape that two bends in the river give it. Its situation as the southern outlet makes it the second city in the United States in importance as to exports. It is the terminus of three canals, and of six or more large railroads, and three local lines, while over twenty lines of steamships connect it with other American and foreign ports. Since 1875, New Orleans has made great progress in manufactures, particularly in cotton goods, cotton-seed oil, machinery, lumber, furniture, fertilizers, sugar refining, rice milling, etc. New Orleans is built upon ground from two to six feet below the surface of the river, and is protected from the rising waters by a system of levees along the water front. It has no sewers, and the drainage is, for the most part, through open gutters in the streets. It contains the United States mint, an old Gothic church (a good sample of Creole-Spanish architecture), and a new custom-house, besides the largest charity hospital in the United States. It has good public schools, maintained at an annual cost of $450,000, with a teaching force of 702, and an attendance of 31,521 pupils. Tulane university, with 77 professors, and having under its control the Sophie Newcomb memorial college for the higher education of girls; the College of the Immaculate Conception, and four colleges for negroes. The Howard memorial, Tulane and Louisiana state libraries, all free, contain together 120,000 volumes. The place where the city is built was first visited by Bienville in 1699. He founded the city in 1718, and made it the capital in 1726, which honor it held until 1880. It was ceded to Spain by France, but in 1765 the people established a separate government only to have the leaders of the movement shot in 1769. It was incorporated as a city in 1804. It was the scene of the battle of New Orleans in 1815, and was captured by Farragut in 1862. The people are of all nations, only nineteen per cent. being of American or English descent. Seventeen per cent. are Creoles, a term applied to people born in the southern states of French, Spanish, or Portuguese ancestors. The Creole dialects are corruptions of French, Spanish, and Portuguese. Mr. Cable's stories revealed to English readers the singularly quaint charm of the phraseology and manners of the Creoles of Louisiana, who are of French descent. Besides the American and Creole inhabitants, the population is made up of Germans, Irish, Italians, Spaniards, Scandinavians, Jews, Negroes, mixed races, Indians, Chinese, and Malays. Population 287,104.

New South Wales, the oldest colony in Australia, formerly included Queensland, Victoria, South Australia, Tasmania, and New Zealand, but now its area is 310,700 square miles, and its population, including 10,000 Chinese, blacks, and half-caste natives, 1,361,120. The Australian Alps, the Blue mountains, the Liverpool range, and the New England hills, are some of the mountains scattered over the country, and the Murray, Lothian, Nepean, Clarence, Shoalhaven, Darling, and Macquarie are some of the chief rivers. The colony was established in 1788 by a party of transported prisoners from England. Then land was given to free colonists, and transportation ceased in 1840. Whereon followed a great social advance, stimulated by the discovery of gold in 1851. The country is covered with trees, such as the eucalyptus, palm, pine, and cedar, and vegetation is very rich. Kangaroos infest this as well as other regions in Australia; there are many lizards and snakes, and birds of beautiful plumage.

Gold was first worked, in 1851, near Bathhurst, and is now found in an area covering 70,000 square miles, to an annual value of nearly $9,000,000. Silver abounds in the Barrier Range, and copper, tin, bismuth, manganese, antimony, mercury, zinc, cobalt, and alum are mined, and precious stones are found in the granite formations. Yet the greatest mineral wealth is found in the coal-fields, extending over 24,000 square miles, and yielding 4,600,000 tons in 1899. Sheep and cattle are extensively raised on the ranges, there being over 50,000,000 sheep now in pasture. The export of wool exceeds 150,000,000 pounds per year. While 140,000,000 acres are devoted to pasturage, only 1,000,000 are given to farming, therefore, the agricultural output is very small. Other exports include, besides gold, coal, and the great wool crop, hides and skins, leather, tallow, and meat, preserved and frozen. The colony has the largest trade, on account of its harbors and resources, of any of the Australian colonies. In 1900, it had 2,771 miles of railroad open for traffic. Public schools maintained by the state are now established, entirely unconnected with the church. Higher education is represented by the university of Sydney, with a staff of about 50 professors and lecturers, and 519 students. The laws of New South Wales are administered by a governor appointed by the crown, an executive council, a legislative council and legislative assembly. See T. A. Coghlan's *The Wealth and Progress of New South Wales.*

New Stars, sometimes called "temporary stars," are bodies which suddenly make their appearance in the heavens, rise rapidly to their full brightness, and soon begin to diminish until they can be seen only with a telescope or, perhaps, not at all.

The earliest one of which we have any account is that of 1572, generally known as "the star of Tycho Brahe." But it is only since the invention of the spectroscope that this class of stars has come to be of especial interest. The new star in the constellation of Corona Borealis, discovered by Birmingham, May 12, 1866, was examined spectroscopically by Huggins and Miller. They found that it possessed both a dark line spectrum and a bright line spectrum, differing in this respect from nearly all the other stars. The next new star was that in the constellation of the Swan, known as "Nova Cygni," discovered Nov. 24, 1876, a red star of the 3d magnitude. Two years later it was fainter than the 11th magnitude. "Nova Andromedæ" was discovered August, 1885; and "Nova Orionis," in December of the same year. But the star which Anderson at Edinburgh discovered Jan. 24, 1892, far exceeded all previous new stars in interest, because the power of the spectroscope had been increased in many ways since the previous stars were observed. For a full account of this star, called "Nova Aurigæ," the reader is referred to Scheiner's *Astronomical Spectroscopy*, where its interesting spectrum is described in detail. The next, and only other important new star was also discovered by Anderson, this time in the constellation of Perseus, Feb. 22, 1901. Many theories have been advanced to explain this curious phenomenon; but the one which at present seems most probable is that advanced by Seeliger, viz., that the new star is produced by some dark body rushing into a meteor swarm or a nebula, the impact of small particles being sufficient to bring the dark body to incandescence.

New Year's Day, is the first day of the year. It is usually now celebrated by feasting and the interchange of presents. The Jews, Chinese, Egyptians, and Mohammedans, while differing as to the time of celebration, all celebrate the first day of the year in their respective calendars. In the Christian era, Christmas day, Easter, and the 1st of March, have each in turn been celebrated, and it was not until late in the 16th century that the 1st of January was universally accepted. In Scotland, France, and in Italy, New Year's day is of more importance than Christmas, but in other countries the latter has superseded the former as a day of rejoicing and of making gifts.

New York, the first state in point of population in the United States, is called the Empire State and has an area of 49,170 square miles. The Appalachian system enters the state in the form of the Adirondack mountains in the northeast, and are cut off from the Catskills by the Mohawk and its valley. The Taconic range of New England enters near the south, and passes on to New Jersey, but is cut by the Hudson, here forming the famous Highlands. The state has some iron, lead, copper, and zinc mines, salt springs, and mineral and medicinal springs, such as those of Saratoga, Ballston, Sharon, Richfield, New Lebanon, and Avon. The most important river is the Hudson, and others are the Mohawk, Black, Genesee, and Niagara. The Susquehanna and Allegheny rise in the southern part of the state. New York has many beautiful lakes, first in point of beauty being Lake George and the Adirondack lakes, but the lakes and rivers breaking into falls, the greatest of all being Niagara, and the Genesee, Trenton, Kaaterskill, Cohoes, Ticonderoga, and Watkin's Glen, make the state famed for its beautiful scenery. When the whites first settled in this territory they found it inhabited by the Iroquois Indians. Just at this time Champlain discovered the lake that bears his name, and Hudson explored the river Hudson in 1609. Not many years later, the Dutch founded some settlements, but in 1664 were forced by the English to give up their city of New Amsterdam, and its name was changed to New York. From that time to the Revolution it belonged to the English.

During this period, to the close of the Revolutionary war (1674–1783), New York was under the rule of over thirty colonial English governors, some of whom had many difficulties to contend with. There were, at periods, difficulties with the Indians, including Iroquois raids and menacing movements on the border settlements of the colony; there were also the harassing hostilities of the French and their dusky allies in 1755–63, the period of the French and Indian war; besides collisions, during the era just preceding the Revolution, between the colonists who had grown restive under monarchical rule and the harsh sway of gubernatorial authority. New York was also the scene of considerable fighting in its northern area, during the War of 1812–14, a conflict which bore heavily upon its border settlements from the Niagara region to the eastern end of Lake Ontario, and on the St. Lawrence from Ogdensburg to the district around Lake Champlain. With peace came the era of canal construction, and later the beginnings of the railway system, and improved highways, and increased settlement throughout the state. It bore also its share of the burdens entailed by the Civil war and the four years of prolonged and calamitous strife. Since then its progress has been both rapid and substantial, and well entitle it to the fame it now possesses as the Empire State in the Union.

In manufactures the state stands foremost in the Union, and is the center of railroad traffic. In 1900, it had a total mileage of railroads of 8,230 miles, and a total foreign trade through its ports in value aggregating $1,250,000,000. It has large mining activities in iron ore, chiefly of magnetite and hematite, besides a large output of granite, marble, slate, limestone, and sandstone. In agriculture, its annual yield is also extensive, especially in corn, wheat, barley, rye, hay, buckwheat, and potatoes. Its manufacturing industries are, moreover, vast, the state having over 3,550 industrial establishments, in which nearly 360,000 hands are employed.

The commerce of the state continues to expand, chiefly through the port of New York, and this demands increased facilities in the way of railroad and canal transportation. The canal commission of the state recommends the enlarging of the state canals, the building of branches, the improving of locks, and even the construction of a new canal, at a cost of sixty million dollars, so as to meet the expanding trade of the state and give increased facilities for water communication with the Great Lakes. These enterprises are part of the current activities of the governing body of New York state.

The returns of the department of public instruction for 1900, show that in that year nearly $33,500,000 was expended by the state for public school education, and of that sum close upon $20,000,000 was apportioned for teachers' salaries. The number of teachers employed during the year was 31,768, while 1,200,575 children attended the schools. The entire public school property of the state was, in 1900, valued at $81,768,500, the number of public schools being 11,931. In the same year, there were 34,105 boys and 42,260 girls taught in the secondary schools, the teaching staff in these numbering 3,888 (1,369 male, and 2,519 female teachers). The expenditure for the year on these secondary schools, amounted to $6,036,375, while the value of the school property was estimated at $28,412,000. The state also made a considerable appropriation during the year for the maintenance of school libraries, the number of which was 1,035, containing over 1,550,000 books. For higher education, $7,660,000 was, moreover, expended in 1900, on the students (nearly 30,000 in number) reported as attending New York colleges, and the technical and professional institutions of the state.

The chief institutions for higher education in the state embrace, besides New York university, Columbia university, Manhattan college, St. John's, St. Francis Xavier, and the College of the City of New York — all having their seat in New York city. Cornell university, at Ithaca; the University of Rochester; Colgate university, at Hamilton; Hobert college, Geneva; Hamilton college, Clinton; Syracuse university; Union college, Schenectady; Niagara university; Canisius college, Buffalo; Alfred university; St. Stephen's college, Annadale; and St. Bonaventure college, Allegany. At Brooklyn there are, besides the Polytechnic institute, Adelphi, St. John's, and St. Francis colleges, and a number of special institutions throughout the state for higher instruction in law, medicine, theology, agriculture, and practical science. At New York city, there are the theological seminaries of the Presbyterian (Union seminary), the Protestant Episcopal, and the Jewish communions; at Rochester, a Baptist denominational seminary; at Auburn, a Presbyterian theological seminary; at Hartwick, a Lutheran, and at Yonkers a Roman Catholic (St. Joseph's) seminary. Most of the universities named in the state have, moreover, law and medical departments, while a few have schools of pharmacy and dentistry, and one, at least (Cornell, Ithaca), a veterinary college, besides agricultural and mechanical courses. There is also, at New York city, a teachers' college, or normal school, for professional training in educational methods.

Its principal cities are New York, Albany, Brooklyn, Buffalo, Troy, Syracuse, Rochester, Utica, Binghamton, and Ogdensburg. Population 7,268,012. The capital is Albany.

New York City, the largest city in America, and in respect to both area and population the second city in the world, stands at the head of New York bay. The original New York occupied the long, narrow Manhattan island, lying between the Hudson — here called North river — and East river, together with 12,100 acres on the mainland, separated from the island by the Harlem river and

Spuyten Duyvil creek. Manhattan island is 13½ miles long and averages 1⅞ miles in width, the area of the city being 41½ square miles. In 1897, however, the new and greatly enlarged city of New York was constituted, by consolidating the old city with Brooklyn and other cities and outlying territory. Under the new charter, the territory embraced within the new limits of New York comprises the former city of New York on Manhattan island, and the annexed territory in Westchester county, the former city of Brooklyn, coterminous with the county of Kings, the entire county of Richmond, and the portion of Queens county included in Long Island

city, the towns of Newton, Jamaica, and Flushing, and a part of the town of Hempstead. This territory is divided into these five boroughs: Manhattan, comprising Manhattan and the adjacent smaller islands; the Bronx, including the part of the former city of New York in Westchester county north of the Harlem river and Spuyten Duyvil creek, and the islands adjacent; Brooklyn, comprising the whole of Kings county; Queens, including the part of Queens county named in the act of annexation, revised by the legislature of 1899, and Richmond, which consists of the county of that name, including the whole of Staten island.

Sandy Hook, 18 miles south of the Battery, marks the entrance to the Lower bay, which covers 88 square miles. The narrows, a mile-wide strait, between Long island and Staten island, separates it from the Upper bay, which contains 14 square miles of anchorage. The Upper bay can also be entered by ships of light draught by the Kill von Kull, to the west of Staten island, and from Long Island sound, through Hell Gate Pass (which see) and down the East river. This inner bay, open throughout the year, is one of the finest and most beautiful in the world.

The first European whose eyes beheld the blue waters of this picturesque harbor was John Verrazani, a Florentine sailor, whose glimpse of it in 1524 was cut short by a storm. But in 1609, Henry Hudson sailed up the bay and also the river which bears his name. Five years later, the Dutch built a fort on Manhattan island, and in 1623 the settlement was named Nieu Amsterdam. In 1674, the British gained possession of Manhattan island, naming it New York, in honor of the Duke of York, afterward James II. of England. During most of the Revolutionary war, from 1776 to 1783, New York was held by British troops. From 1785 to 1789, it was the seat of government of the United States.

New York's prominence is due to its position as the gateway of North America. At the head of a magnificent harbor, having an immense water frontage, lined with hundreds of docks, while the New Jersey shore is similarly lined, it receives 66 per cent. of the imports of the country and sends out 44 per cent. of the exports.

In East river, on Ward's, Randall's, and Blackwell's islands, are the great charitable and other institutions of the city. In the harbor are three small islands — Governor's island, occupied by the United States government; Bedloe's island, on which stands the Bartholdi statue of Liberty, and Ellis island, where are now received the emigrants, until lately landed at the famous Castle Garden at the Battery. In some years almost half a million emigrants enter the port of New York.

The lower part of Manhattan below 14th street, known as old New York, which is still the most densely populated part of the city, abounds in crooked, winding streets. Above

14th street the streets and avenues are wide and regular. New York is more famous, perhaps, for noted streets than for noted buildings, Broadway, Wall street, Maiden Lane, Fifth avenue, the Bowery, and others being known everywhere. Noteworthy among public buildings are the city hall, post office, the Tombs (prison), produce exchange, Madison Square garden, and Academy of Design. Among the finest churches are the Reformed (Dutch) church, Fifth avenue and 48th street, held by some to be the finest piece of architecture in America; Temple Emanuel, St. Patrick's cathedral, Trinity church, and the new Protestant cathedral of St. John the Divine. Among the tallest and finest office buildings are the Park Row, New York Life, St. Paul, and Tract Society buildings. The main pleasure ground is the famous Central Park (which see). There are also many small parks—the Battery, Union Square, Madison Square, etc., and three large parks on the mainland—Jerome, Van Cortlandt, and Bronx. The long and narrow shape of Manhattan island has caused the building of tall brick and stone tenements, in which the poor, and many in easy circumstances, are so crowded that in parts of the East Side there are more people to the square mile than anywhere else in the world.

There are four parallel elevated railroads, running up and down the island, which carry 750,000 passengers daily. There are also numerous trolley lines. A four-track underground railway is now under construction at a cost of $35,000,000. The route begins at the city hall and continues up Elm st. to Lafayette place, thence to 4th av., up 4th av. to 42d st., through 42d st. to Broadway, thence up Broadway and the Boulevard to 104th st., where it branches into two sections, one continuing up Manhattan Island to Fort George and beyond to Marble Hill, near Kingsbridge, the second going to the east to Lenox av., up Lenox to 141st st., thence under the Harlem river into the Bronx as far as Bronx Park. An extension of this road is projected which is to extend from New York city hall to Brooklyn, passing under the East river at South Ferry. Four railroads enter the city by a viaduct and tunnel from the north; but most of the trunk lines have their depots on the New Jersey shore. The Pennsylvania Railroad Company has projected a tunnel under the Hudson, which is to extend under the island and East River to Brooklyn and Long Island.

The great Brooklyn bridge (see BROOKLYN) carries huge crowds daily by means of its electric roads, and perhaps the greatest daily jam to be seen anywhere is at the New York entrance to the bridge from five to seven o'clock in the evening. A new East river bridge is now under construction, from the foot of Broadway, Brooklyn, to the foot of Delancey slip, Manhattan. It is proposed that this bridge shall be 118 feet wide, and 135 feet high for 400 feet at the middle of span at high water and lowest position of bridge, and will furnish accommodations for four surface railroad tracks, two tracks for elevated trains, two roadways for vehicles, two footways for pedestrians, and two cycle paths. The towers will be made of steel. The estimated cost is $8,000,000, exclusive of the right of way.

There are also many steam ferry boats on both East and North rivers. Two other large bridges, besides many smaller ones, span the Harlem; High bridge, which carries the Croton aqueduct, and the beautiful Washington carriage bridge.

BROOKLYN, which before its consolidation with New York, ranked as the fourth city in the United States, lies on the west end of Long Island, on the East river. The borough now occupies an area of 77.62 square miles, and has a water frontage of 33 miles. Besides numerous lines of ferries, it is joined to Manhattan by the magnificent Brooklyn suspension bridge, 5,989 feet in length by 85 in breadth, and with a river span of 1,595½ feet, intended for foot passage, carriages, and railways. The bridge was opened to surface lines Dec. 31, 1897, and it is estimated that about 100,000 trolley cars now cross the structure each month. It is the largest suspension bridge in the world, and its cost was about $15,000,000. A large number of railroads also connect the city with different parts of Long island, and a fine system of surface and elevated railways secures connection between different parts of the city. Some of its docks are the largest works of the kind in the country, covering from forty to sixty acres each. The Brooklyn United States navy yard comprises 144 acres, situated on a little bay in the East river, known as Wallabout channel, and has a water front of nearly three miles. In 1815, the *Fulton*, the first steam war vessel, was built at the yard after plans prepared by Robert Fulton. The first dry dock was begun in 1841, and completed ten years later at a cost of about $2,000,000. It is estimated that the government has spent over one billion dollars in this yard, and the property now there is valued at over $50,000,000.

In newspapers, theatres, educational institutions, etc., Brooklyn is well supplied, like all modern cities. The great Music hall is one of its finest buildings. It is the "city of churches," having hundreds of beautiful church buildings. Greenwood cemetery is one of the most beautiful burial grounds in the world. Its area of 400 acres contains many fine monuments. Prospect park, with an area of 540 acres, with its fine ocean views, is unsurpassed. The town was settled in 1636 under the Dutch, and was incorporated as a city in 1834.

The executive power of the city of New York is vested in the mayor and the officers of departments. The mayor is the chief executive officer, and he is a magistrate. The salary of the office is $15,000 a year.

The mayor appoints the heads of all departments save that of finance, and within six months after taking office he can remove any public officer appointed by the mayor, except members of the board of education and school boards, and certain judicial officers.

The legislative power of the city is vested in two houses, known respectively as the council and the board of aldermen, and together styled "The Municipal Assembly of the City of New York." The council consists of 29 members, one of whom is the president, and who is chosen for that office by the people. Of the other 28 members, three are chosen from each of the five council districts into which the boroughs of Manhattan and the Bronx are divided; three from each of the three districts in the borough of Brooklyn; two from the borough of Queens, and two from the borough of Richmond. Their terms are for four years. The board of aldermen consists of one member elected from each of the 60 assembly districts in the entire city for a term of two years.

The police force of the city numbers 7,614 men. The strength of the fire department is, regular force, 2,451; volunteer force, 3,725; total, 6,176. The net bonded debt of the city is $272,398,500; annual expenditure, $98,100,413; assessed value of property, real, $3,168,547,700; personal, $485,594,573. The various parks of the city contain a total of 6,962 acres. Of these the finest are Central Park, Manhattan, and Prospect Park in Brooklyn. Some of the others which are extensive in area, are as yet unimproved. The cemeteries contain 3,155 acres. There are 1,738 miles of paved streets; 353 miles of water front; 1,507 miles of sewers; and 785 miles of street railway, including elevated roads.

The water supply of Manhattan is received from the Croton watershed, thirty miles north of the borough. The capacity of the aqueducts and reservoirs is 380,000,000 gallons per day. The water supply of Brooklyn is obtained from the streams that drain the portion of the southern slope of Long Island lying to the west of Amityville, supplemented by wells driven into the saturated sand at different points in the same territory. From these streams and wells the water is delivered into iron pipes or brick conduits, which conduct it to the main pumping station at Ridgewood. Here it is raised to the Ridgewood reservoirs, having a capacity of about 300,000,000 gallons, and from them is passed into the distributing mains supplying the greater part of Brooklyn. The other boroughs are supplied by local plants, some of which are owned by the city and others by private corporations. There are in the city more than 2,000 miles of water mains.

The number of pupils in the public schools of the city is 443,072; the number of principals and teachers employed is 11,070. The college of the city of New York and the Normal school are the highest schools of the public system, and are free. Of higher institutions of learning here located, the more important are Columbia university, with 339 instructors, and New York university, with 175 instructors.

There are three divinity schools, Union Theological seminary (Presbyterian), the General Theological seminary (Episcopalian), and the Jewish Theological seminary. Of more than one hundred general and special libraries in the city, the more important are, New York Public library, formed by the consolidation, in 1895, of the Astor and Lenox libraries and the Tilden fund, and containing 500,000 volumes; Columbia university library, 295,000 volumes; Mercantile, 263,000 volumes, and Brooklyn, 150,000 volumes. The museum of art and museum of natural history are in Central Park.

The following table gives the population of the city and of the different boroughs: —

Boroughs.	Population Census of 1900.	Area in Acres.	Area in Sq. Miles.
Manhattan	1,850,093	14,038	21.93
Brooklyn	1,166,582	49,680	77.62
Bronx	200,507	26,017	40.65
Queens	152,999	82,883	129.51
Richmond	67,021	36,600	57.19
Total	3,437,202	209,218	326.90

New Zealand lies in the Pacific ocean about 1,200 miles to the southeastward of the Australian continent. It is a British crown colony, with a local government extending back to the year 1852. There are two principal islands, known as the north and middle islands, besides the south or Stewart island and some small outlying islets. The total area is estimated at 104,471 square miles, with a population, in 1896, of 703,360, exclusive of aborigines which are chiefly Maoris (probably 50,000 in number). The chief town is Auckland, with a population, including suburbs, of 57,616. Wellington is the seat of government (population 41,758). The other towns of note are Christchurch (population 51,330), and Dunedin (population 47,280). Of volcanic origin, New Zealand has chains of high mountains, hot geyser springs, and other natural features of a bold and varied character, incident to its eruptive origin. It has a temperate climate favorable to the growth of rich succulent grasses and the rearing of sheep and cattle. Its area under crop exceeded, in 1899, 12,000,000 acres, while 20,000,000 acres were still under forest, and 9,000,000 acres of barren mountain tops, lakes, and worthless country. Large amounts of capital are invested not only in agricultural and mining operation, but in the meat-freezing and preserving industries, and in tanning, wool scouring, and in factories for making butter and cheese. Besides the wool crop and the farm and dairy products, there is a large annual export of tallow, hides, skins, and leather, together with gold, valued at $5,000,000 for the

yearly output. There are two houses of parliament, the members of both of which are paid. In the popular chamber, four Maori members sit, representing native districts under the Maori Representative Act. There is no state church in the colony, nor state aid given in any form to religion. The school system is administered by an educational department of the government under a minister, assisted by education boards and school committees. The University of New Zealand is solely an examining body, it awards scholarships to be held by students at affiliated colleges. There are four of the latter, viz., Otago university at Dunedin, with nine professors; Canterbury college at Christchurch, with six professors; Auckland university college, with four professors; and Victoria college, Wellington, with four professors, besides lecturers at each. They are all endowed with land, and in 1899 had 766 students in attendance. Most of the railways in the colony belong to the state and yield a good annual revenue; the gross mileage in both islands is 2,271 miles. In the chief towns there are tramways worked by cables, steam motors, or by horses. In common with Australia and Tasmania, New Zealand, in 1899, offered a military force to the imperial government for service in South Africa.

New'ark, the county seat of Essex county, N. J., and a port of entry, lies on the Passaic river, nine miles from New York. It is a handsome city, with small parks and wide, shaded streets. It has a city hall, court house, public library, and many churches, but its main feature is the 400 or more manufactories of brass and iron ware, hardware, machinery, trunks, saddlery, boots and shoes, hats, etc. The city was settled by a Connecticut colony in 1666 and chartered as a city in 1836. Population 246,070.

New'ark, the county seat of Licking county, O., lies on the Licking river, 31 miles northeast of Columbus. It is a manufacturing city, turning out stoves, machinery, furnaces, wagons, boilers, flour, woolens, and glassware. Population 18,157.

New'berry, Prof. **John Strong,** an American scientist, was born at Windsor, Conn., Dec. 22, 1822, educated at Western Reserve college, Hudson, O., and Cleveland Medical college, graduating from the latter in 1848. Practicing medicine in Cleveland a few years, he accepted an appointment in 1855 as surgeon and geologist to accompany the United States exploring expedition sent out to examine the country between San Francisco and the Columbia river. In the year 1857 he explored the cañon of the Colorado, devoting nearly a year to the task. In 1859, he made trips in the interests of science through southern Colorado, Utah, northern Arizona, and New Mexico. During the Civil war he was in charge of all the operations of the United States Sanitary Commission throughout the Mississippi valley. At the close of the war, he was appointed professor of geology in the School of Mines, Columbia college, New York. In 1869, he superintended the geological survey of the state of Ohio. He was elected a member of nearly all the scientific associations of his own country and of Europe, and received the Murchison medal from the Geological society of London in 1888. Perhaps his first publication was his report upon *The Geology, Botany, and Zoology of Northern California and Oregon;* and his latest was *The Paleozoic Fishes of North America.* He died at New Haven, Conn., Dec. 7, 1892.

New'berry, Walter Loomis, an American merchant and philanthropist, was born at East Windsor, Conn., Sept. 18, 1804. He removed to Chicago in 1833, where he amassed a fortune in trade and banking. He left over $2,000,000 with which to erect and maintain a library. The building which was a result of this bequest fronts upon Washington Common, Chicago, and is one of the architectural ornaments of the city. The library it contains is one of the finest reference libraries in America. Mr. Newberry died at sea, Nov. 6, 1868.

New'burg, the capital of Orange county, N. Y., lies on the left bank of the Hudson, in the beautiful Highlands. It has foundries, boiler works, shipyards, powder mills, and manufactures flour, woolen and cotton goods, leather, soap, brushes, paints, etc., and ships large quantities of butter, grain, flour, and coal. In the Revolutionary war, the American army disbanded here on June 23, 1783. Population 24,943.

New'buryport, a city and port of entry of Massachusetts, on the south bank of the Merrimac river, three miles from its mouth, and 37 miles by rail northeast of Boston. A long, shady, high street, with a pond of six acres, is its chief ornament. Shipbuilding is carried on, and there are a number of large cotton and shoe factories, besides manufactories of combs, hats, pumps, etc. Here George Whitefield, who died in 1770, is buried, and here Wm. Lloyd Garrison was born. Population 14,478.

New'castle-upon-Tyne', a city and county by itself, lies upon the river Tyne, in Northumberland, 117 miles from Edinburgh. During the Roman occupation of Britain, it was a military station, and afterward became a monastic settlement, and was known as Monkchester. In 1080, Robert Curthose constructed a fort which he called Newcastle. The city is built mostly on slopes and rising ground, and shows the combined effects of ancient and modern architecture. Some of the interesting buildings are the Norman Keep, the Black Gate, the St. Nicholas cathedral, and the churches of St. John and St. Andrew. The central part of the town owes its beauty and stability to Robert Grainger,

who developed and built it up. Newcastle has a large public library, two colleges, the Royal Infirmary, Jesus' Hospital, the Keelmen's Hospital. Its principal manufactures are marine and locomotive engines, machinery, heavy ordnance, carriages and harness, lead, glass, earthenware, cement, brick, tile. It has been since the 13th century the most important coal-shipping center in Europe. Population 230,000. See *Histories of the Town*, by J. R. Boyle, and others.

New'comb, Simon, a distinguished mathematical astronomer, born at Wallace, Nova Scotia, March 12, 1835. Coming to the United States in 1853, he secured, through the influence of Joseph Henry, an appointment as computer on the *Nautical Almanac* in 1857. He graduated from the Lawrence Scientific school at Cambridge in 1858, and spent three years there as a graduate student, at the end of which time he went to the Naval Observatory in Washington as professor of mathematics in the United States navy. His work here in connection with the establishment of the 26-inch equatorial, the various expeditions to observe transits of Venus and solar eclipses, his superintendence of the *Nautical Almanac*, and his important memoirs on celestial dynamics, have placed him in the front rank of astronomers. In 1884, he accepted the chair of mathematics at Johns Hopkins university while retaining his work in Washington. Professor Newcomb is a man of extraordinarily wide interests and has thought and written much on subjects outside of his own specialty, particularly on political economy. It goes without saying that he has been the recipient of many honorary degrees besides medals and honorary memberships from learned societies.

New'ell, Harriet Atwood, was born at Haverhill, Mass., Oct. 10, 1793. At the age of nineteen she was married to Samuel Newell, and with him sailed for India, February, 1812, in company with Dr. Judson, to open a mission there. When they arrived at Calcutta the Bengal government refused to admit them into the city. Ordered to leave the country, they sailed for the isle of France, where Mrs. Newell died, Nov. 30, 1812. She was one of the first lady missionaries to go out from the United States. Though she died on the threshold of her chosen career, her sublime devotion has inspired thousands of her sisters to imitate her example. Her memoirs by her husband, with her letters, have been translated into several languages.

Newfound'land, an island colony of Great Britain, in North America, lies at the mouth of the St. Lawrence. It is not incorporated with the Canadian Dominion. It is three-cornered in shape, has a length of 370 miles, a breadth of 290, and an area of 42,200 square miles. Although the surface looks barren and broken, the soil is good, and good crops of potatoes, hay, grain, etc., have been raised of late years. The coast is indented by numerous bays and estuaries, which afford excellent harbors. Its waters abound with fish, and most of the people are engaged in the fishing industry. There is good caribou shooting on the island and excellent sport for fishermen. The seal trade is still large. Almost one-third of the surface of Newfoundland is covered by fresh-water lakes and small winding rivers. Copper is extensively mined, and rich deposits of lead, iron, coal, and nickel have been found. The fisheries of cod, seal, herring, and lobster, together with the canning business, are very valuable.

Newfoundland was discovered June 24, 1497, by John Cabot, and visited by Gaspar de Cortereal in 1500, and two years later permanent fishing colonies were established by Biscayans, Portuguese, and French. England came into possession of the island from the French by the treaty of Utrecht in 1713. Newfoundland was under the exclusive control of an English government from 1728 to 1855, when the form was modified by adding a cabinet, legislative council, and general assembly. The island politics are disturbed at times by the claims of French fishermen and the French fleet, who visit the coast annually, and assert fishing rights to the detriment of the islanders, basing their claims on French possession of the islands of St. Pierre and Miquelon. Population (estimated, 1901) 210,000. The capital is St. John's (population 30,000). The other chief towns are Harbour Grace, Carbonear, and Bonavista. Dependent on Newfoundland is Labrador, with an area of 120,000 square miles, and a population of 4,200.

New'gate, a famous London prison, stands opposite the Old Bailey, at the end of Newgate street. Its high, windowless walls for a long time inclosed the principal prison of the city, but it is now under the control of the court of aldermen. It derives its name from having been the *new gate* to the city prior to 1218. The prison was destroyed by the fire in 1666 and rebuilt in 1780. Newgate was discontinued as a prison by the prisons bill of 1877. See Griffith's *Chronicles of Newgate.*

New'man, John Henry, Cardinal, a leader of the Church of England, afterward, in 1845, a communicant of the Catholic church, and in 1879 a cardinal by appointment of Leo XIII., was born at London, Feb. 21, 1801, and graduated from Trinity college in 1820. In 1822, Newman was elected a fellow of Oriel college, and there formed the intimacy with Pusey and Froude which exerted such an influence on his after-life. In 1832, he published his first book, called the *Arians of the Fourth Century*, in which he vindicated the divine nature of Christ, and laid down the dogmatic definition of the Son as being "of one substance" as the Father, not "of like substance." In 1833, he traveled to the

Mediterranean with Froude and his father for his health, and on the journey wrote most of the poems which were afterward published as *Lyra Apostolica*, the object being to assert the spiritual power of the Church of England. On his return to England, he entered with all his energies into the Tractarian movement in the Anglican church. He wrote a great many of these tracts himself, defined a line between Protestantism and Roman Catholicism, and delivered courses of lectures on that subject, teaching that the Anglican church stands midway between the Catholic and popular Protestant. His most notable book is the *Apologia pro vita sua* (a history of his religious opinions). On Oct. 9, 1845, he entered the Roman Catholic church. As a Catholic, his works are, mainly, *Loss and Gain*, a story of a conversion; *Callista*, the story of an African martyr; *Grammar of Assent;* a volume of lectures on *Anglican Difficulties*, a collection of *Verses on Various Occasions;* and several volumes of sermons. To reward and conciliate the English moderators, of whom Newman was the head, Leo XIII. made him a cardinal on May 12, 1879. He died at Edgbaston (Birmingham), Aug. 11, 1890, of pneumonia.

New'port is the county seat of Campbell county, Ky., lying opposite Cincinnati, on the Ohio, at the mouth of the Licking river. The city has large rolling mills, foundry, bolt works, steam mills, and tile works. Population 28,301.

New'port, a city of Rhode Island, is a port of entry, and was formerly one of the capitals of the state. It contains a courthouse, statehouse, library, and many summer homes and villas, and is one of the most fashionable watering places in the United States. The Round Tower, or "Old Stone Mill," stands in Touro Park. Cotton mills, lead and oil works, and a brass foundry are among the industries of the city. The town was settled in 1638 by eighteen followers of Roger Williams. Population 22,034.

New'port News, Va., a rapidly growing town, and port of entry, on the James river, Hampton Roads, southeastern Virginia. It is the capital of Warwick county, is connected by electric railway with Hampton and Old Point Comfort, and is fourteen miles north of Norfolk, and seventy miles southeast of Richmond. Possessing a magnificent harbor, it has extensive ship-building plants, dry docks, grain elevators, and capacious warehouses on its piers. It has a large foreign commerce, chiefly of grain. It has a large trade in peanuts. Population 19,635.

New Rochelle (*rō-shĕl'*), **N. Y.,** a town in Westchester county on an inlet of Long Island Sound, and on the New York, New Haven, and Hartford railroad. Being within twenty miles northeast of New York city, many merchants of the great capital make their homes here, and find it a salubrious and attractive resort. It possesses good schools, churches, banks, and other adjuncts of a growing suburban city and watering place. Population 14,720.

News'paper, a sheet of paper printed and distributed from time to time for the purpose of conveying news. The number of newspapers now in the world is estimated at about 45,000. The bulk is issued as follows: United States, 20,000; Germany, 5,500; France, 4,100; Great Britain and Ireland, 2,385, besides 2,290 magazines and reviews; Austria-Hungary, 3,500; Italy, 1,400; Spain, 850; Russia, 800; Switzerland, 450; Belgium and Holland, 300 each, and Japan, 200. Of the languages in which they are published, 17,000 are printed in English; 7,500 in German; 6,800 in French; 1,800 in Spanish, and 1,500 in Italian. Newspapers first came into existence when the reports of the Roman imperial army were transmitted to the generals in all parts of the country, but for the actual newspaper we are indebted to Germany, where in Augsburg, Vienna, Ratisbon, and Nuremburg, it was, early in the 15th century, the practice to issue news sheets in the form of letters. Yet the first newspaper that at all covered the same idea as those of the present day, was issued in Venice, by order of the Venetian government in 1566, and called the *Notizie Scritte*. At first they were not printed, but written out, and hung up in various public places, where the people could read them on payment of a small coin. The first actual English newspaper was the *Weekly News* of 1622, edited and published by Nathaniel Butler. The London *Weekly Courant* came out in the same year. The first daily paper was the *Daily Courant*, which appeared printed on one side only, in 1702. To-day (1901), the daily circulation of newspapers in the United Kingdom reaches 8,500,000. The regular system of advertising, which now supports the newspaper, and benefits the advertiser, did not begin until 1673, when the columns of a few papers were opened to regular classified advertisements. Some of the principal and largest newspapers of to-day are: In England, the (daily) *Times*, *Daily Mail*, *Telegraph*, *Standard*, *Star*, *Echo*, *Evening News*, and *Post;* in France, *Temps*, *Figaro*, *Siècle*, *Petit Parisien*, and *Le Petit Journal*.

There are now published in the United States over 20,000 newspapers, of which about 2,100 appear daily. The first newspaper published in America was *Publick Occurrences* (1690), followed in 1704 by the *Boston News-Letter* and the *Boston Gazette*. At the present time a newspaper is not only a sheet for disseminating news, but is apparently a leader in politics, a commentator on the same, on religion, research, science, amusement and sport, and social and political economy. See Baker's *The Newspaper World*.

Newt, a common salamander, represented by several distinct species, abundant in quiet waters of the United States and Europe. It is also called eft and triton. The common newt of the eastern United States (*diemictylus*) is about three and one-half inches long and is shaped like a slender lizard. It varies in color, but is commonly pale greenish above and pale yellowish below with small black specks. A variety of the common water newt is reddish with red spots and is found in damp places in the woods. The newts feed on insects, larvæ, snails, and the like. One in California reaches a length of six inches. See Gage's *Life-History of the Vermillion-spotted Newt, Amer. Naturalist,* December, 1891.

New'ton, a city of Massachusetts, about seven miles from Boston, and almost surrounded by the Charles river. It is used as a suburban residence by many Boston people, and manufactures cloth, silk, shoddy, glue, etc. Population 33,587.

New'ton, Sir Isaac, the foremost English expounder of applied mathematics. As a natural philosopher he stands without a peer, unless, perhaps, Helmholtz is to be admitted to this category. To save space we shall first outline his chronology and then his achievements. He was born at Woolsthorpe in Lincolnshire on Christmas day, 1642 (old style). He early showed an inventive and mechanical genius, preferring to make windmills, kites, etc., rather than to indulge in the ordinary play of children. His uncle, a Mr. Ayscough, persuaded his mother to send him to Cambridge university, where he entered Trinity college June 5, 1661. In January, 1665, he graduated bachelor of arts; was elected fellow of Trinity in 1667; and graduated master of arts, in 1668. In October of the following year he was elected Lucasian professor of mathematics at Cambridge. His election as fellow of the Royal society occurred Jan. 11, 1672. The publication of his immortal volume, the *Principia*, marks the year 1687 as the beginning of a new era. In four years (1692) this work was practically out of print; and it was not until 1713 that a second edition appeared. Newton began a new rôle in 1689 as representative of Cambridge university in parliament. In 1703, was conferred upon him the highest honor in science to which an Englishman can aspire, namely, the presidency of the Royal society. Only two years elapsed until the order of knighthood was made illustrious by being conferred upon him. The year 1697 marks his departure from Cambridge and his appointment as master of the mint, an important public office which he filled with distinction until his death, which occurred in 1727.

So much for the mere times and places associated with Newton's life. Passing now to the work of the man, we find it so profoundly influencing, and so thoroughly interwoven with the entire subsequent history of physical science as to make a summary of his achievements well nigh impossible.

1. Among his earlier studies must be mentioned the brilliant series of optical experiments by which he proved white light to be composed of many simple colors, and by which he explained the color of natural bodies. Among many other important contributions to optics may be mentioned his accurate description of the phenomena of diffraction, the cause of colors exhibited by thin plates, and a measurement of the wave-length of light, though in terms of the corpuscular theory.

2. Of that branch of astronomy which is known as Celestial Mechanics, Newton is practically the creator. Having clearly formulated the fundamental principles of dynamics, he proceeded to ask whether the facts described by Kepler's Laws (see KEPLER) could not be expressed in a still simpler manner. The answer to this question is found in the *Principia*, where he shows that all the celestial motions are mere consequences of the one general law of gravitation, namely, that the force of attraction between any two particles varies directly as the product of their masses and inversely as the square of their distances. This law was first tested by applying it to the moon's motion about the earth; and the attraction of the earth, on this basis, was found exactly to account for the behavior of the moon. In this connection every student should be warned against the popular notion that Newton discovered the explanation of gravitation. Nothing could be further from the truth. Indeed Newton himself expressly disclaims any such thing; and insists that, while he has succeeded in describing some of the phenomena of gravitation, he will not even venture a guess as to the cause of gravitation. It need hardly be added that we are to-day apparently as far from any satisfactory explanation of gravitation as in the days of Newton.

3. In mathematics, his genius is perhaps best shown by the fact that he not only discovered the law of gravitation, but invented the differential calculus by which to discuss the facts involved. But just how the honors for the discovery of this powerful means of investigating mathematical problems are to be shared between Newton and Leibnitz is a question which has perhaps not even yet been satisfactorily answered. See Brewster's *Life of Newton.*

New'ton, John, an English divine and religious poet, and a friend of Cowper, was born at London, July 24, 1725, and at eleven years of age joined his father on shipboard for six years. He was then impressed into the navy, and from there exchanged to an African cruiser, and then on a slave trader, where he remained for two years before returning to England in 1747. He renounced sailing in 1755, and in 1758 applied for holy orders, but was refused. He was then offered

the curacy of Olney, where, four years later, he formed the friendship of the poet Cowper. Newton was a pronounced Calvinist. He left Olney to become rector of St. Mary Woolnorth in London, where he died Dec. 21, 1807. His prose works are little read, but his *Olney Hymns* are still used and fresh in the memory of all. See *Life*, by Richard Cecil.

New'ton, General **John,** an American engineer and soldier, was born at Norfolk, Va., Aug. 24, 1823, and graduated at West Point in 1842. His first professional services were rendered as assistant instructor in engineering at the Military academy, whence he was transferred to Utah as chief engineer of the expedition sent in 1857 to Salt Lake. At the outbreak of the Civil war he was engaged in the construction of fortifications along the Atlantic and Gulf coasts. When the safety of Washington was threatened in 1861, he was put in command of the defenses, and given the rank of brigadier-general of volunteers. Having served throughout the Peninsular campaign as brigadier, at Fredericksburg he commanded a division and rose to the rank of major-general. He rendered conspicuous services at Chancellorsville and further distinguished himself at Gettysburg. He was thereupon sent to assist Sherman, and he arrived in time to take part in the capture of Atlanta. At the close of the war, he returned to the work of the engineer corps of the regular army with the rank of lieutenant-colonel. His greatest work of engineering was the removal of the obstruction called Hell Gate in the East river, New York. After this he was given the position of chief of the engineering department with the rank of brigadier in the regular army. He retired from the service in August, 1886, and was elected president of the Panama Railroad company in 1888. He died at New York, May 1, 1895.

Ney (*nā*), **Michael,** one of the famous marshals under Napoleon, was a cooper's son, born at Saarlouis, Jan. 10, 1769. At the beginning of the revolution he was an under-officer in a hussar regiment, but merit soon brought him promotion, and after the siege of Mainz, in 1794, he was made adjutant-general. He earned the rank of brigadier-general under Jourdan, in 1796, and for the capture of Mannheim, in 1799, was made general of division. He was also at one time commander of the army of the Rhine, and after the declaration he married a friend of Napoleon and was made inspector-general of cavalry. When the empire was established he was made marshal of France. He stormed Elchingen, and for this was created duke of Elchingen. At Jena and Eylau he served with distinction, as well as in Spain and in Russia. At Waterloo, he led the center and had five horses shot under him, but after the surrender of Paris, in flight to Switzerland, he was recognized by a costly sword he wore, and condemned by the house of peers to die for high treason, in going over to Napoleon on his return from Elba. He was shot in the Luxembourg gardens, Paris, Dec. 7, 1815.

Nez Perces (*nā' pĕr'sĕz'*), meaning "pierced nose," a tribe of American Indians that settled in Idaho, and were friendly to the whites. In 1877, some refused to accede to a treaty reducing their reservation, and attacked the settlers and soldiers, and then fled to Montana and Dakota. They were overtaken, and the 350 survivors transferred to the Indian Territory, and in 1885 were sent to Idaho, and some to join the Colville Indians in Washington.

Ngami (*ng a'mē*), **Lake,** discovered by Livingstone in 1849, is situated in the northern extremity of the Kalahari desert, in British South Africa, is 2,810 feet above sea level. Its size depends on the rainfall in the surrounding country, but its average length is 50 miles, and width from 10 to 20. Its chief tributaries are the Okovango on the northwest, and the Zouga on the east.

Niag'ara ("Thunder of Waters"), a river of North America, which forms part of the boundary between New York state and the province of Ontario. It flows from Lake Erie into Lake Ontario, a course of 36 miles, during which it makes a total descent of 326 feet, about 50 feet in the rapids immediately above the great falls, and nearly 110 feet in the seven miles of rapids below. It incloses several islands, the largest, Grand island, being nearly 10 miles long. Four miles below this island, are the most famous falls in the world. The center of the river here is occupied by Goat island, dividing the cataract into two, the Horseshoe (Canadian) Fall, with a descent of 158 feet, and the American Fall, 162 to 169 feet; the outline of the former is about 2,640 feet, of the latter 1,000 feet. The volume of water which sweeps over this immense chasm is about 15,000,000 cubic feet a minute. The depth of water on the crest of the falls is less than four feet, except in a few places, notably at the apex of the Horseshoe Fall, where it is about 20 feet. The limestone edge of both falls is rapidly wearing away in the center. For seven miles below the falls, the river is shut in between perpendicular walls of rock, from 200 to 350 feet high. Just below the cataract, the river is crossed by a suspension bridge for carriages and foot-passengers, and a mile and a half further down there are two railroad bridges, one a cantilever bridge, about 100 yards apart. On both shores the lands bordering the river, for some distance above and below the falls, are under the immediate control of the respective governments. The "New York State Park at Niagara Falls" embraces 115 acres, and the "Queen Victoria Niagara Falls Park" about 154 acres. From both sides visitors clad in waterproofs are conducted under the Falls. The immense water-power supplied

by the Falls was utilized at Buffalo by the Pan-American exposition, in 1901, in its electric displays.

Niag'ara Falls City, N. Y., a rapidly growing town in Niagara county, on the Niagara river, the mecca of every visitor to the New World, for the incomparable beauty and majesty of the spectacle — the mighty Falls of Niagara, — which here hurl their mass of waters, by the American Fall and the Horseshoe Fall, over into a narrow seething gorge, a chute of 160 feet. The situation of the city and the famous cataract is 20 miles north of Buffalo, and about 13 miles south of Lake Ontario, with whose waters the Niagara river mingles. A number of railway lines here converge, viz., The New York Central; the Erie; the Lehigh Valley; and the Michigan Central railroads. All of them have their connections into Canada, which is entered from New York state by a series of bridges, cantilever and suspension; there is also across the chasm a foot and carriage bridge, and connecting links between the city and Goat island; also state reservations in the immediate neighborhood of the cataract. Of recent years, engineering skill has, by a series of tunnels and the construction of a hydraulic canal, utilized for practical industrial purposes the enormous water-power here obtainable, — a utility which the city of Buffalo has taken advantage of. Population 19,457.

Niag'ara Falls, Tunnels and Power Plant. The force going to waste over the Falls of Niagara has been estimated at 7,000,000 horse-power. Such unused resources naturally attracted the attention of engineers and economists at an early day, and in 1873 a small canal utilized about 6,000 horse-power for certain mills. The invention of the dynamo and the transmission of energy by electric wire gave a new impulse to the attempt to use more of the power in sight. A company was organized in 1886, and chartered by the legislature of New York, having this end in view. Experts visited Europe to study approved methods of power transmission. Work was begun in 1890 by the Cataract Construction company, and a tunnel was dug, 7,000 feet long, 21 feet high, and 19 wide. It required three years time and the outlay of about $4,000,000 to carry the undertaking to completion. The water is drawn from the river by means of a canal 110 feet wide at the end and 180 feet at the mouth, the canal being 1,400 feet long. The water, which is brought from the river by the canal, is carried over the turbine wheels, 14 in number, each having 5,000 horse-power; and, after passing through the turbines, it is carried away by the tunnel. Each turbine is connected with a dynamo of 5,000 horse-power, and the electric current is thus brought to Buffalo, 18 miles distant, where it is used for lighting the city, operating tramways in the streets, pumping water for city use, and running machinery in various factories. It is expected that the power thus generated will be distributed over all the western part of the state by improved processes of transmission.

Nibelungenlied (*nē'be-lōng-en-lēd*), a German epic, ranking as one of the greatest poems of the world. The oldest elements of the work must have been long current in the form of popular songs; but the incidents of the story seem to have been fused into one narrative before the 12th century, though by whom it was done is unknown. The story of the poem is as follows: "Siegfried, the son of the king of the Netherlands, becomes possessed of the fabled wealth of the Nibelungs, which carries with it evil to its possessor. He marries Kriemhild, the daughter of Gunther, king of Worms, and helps Gunther to win Brunhilde of Iceland. Then there is a dispute as to whether Siegfried or Gunther be the greater, and Brunhilde induces Hagan to murder Siegfried. Kriemhild, after some years, marries Attila, king of the Huns. After Kriemhild became possessor of the Niebelungen wealth, Hagan took it from her and sunk it in the Rhine and after several years Kriemhild, still mourning for Siegfried, and desiring to be revenged for his death, asked her brother to visit her at her court. This he did, with 11,000 armed Burgundians, and the remainder of the poem is devoted to the wars and sufferings of the Burgundians. See English translations by Lettsom, Foster, Barham, and Birch. See also Carlyle's *Miscellanies*, Vol. III.

Nicæa (*nī-sē'-ă*), a city of ancient Bithynia, in Asia Minor, lies on the east shore of Lake Ascania. It was built in 316 B. C. by Antigonus and named Antigoneia, but was changed to Nicæa by Lysimachus in honor of his wife. It is famed as the seat of two ecumenical councils, the first held by Emperor Constantine in 325 A. D., and the second called by the Empress Irene, in 787.

Nicaragua (*nē-kă-rā'gwă*), an independent Central American republic, stretches across the isthmus from the Caribbean sea to the Pacific ocean, and lies between Honduras on the north and Costa Rica on the south. It has an area of about 49,200 square miles. The Central American Cordilleras extend through the country from northwest to southeast, not far from the Pacific coast. From these the surface sinks rapidly westward, and the country is studded with large lakes, the largest, Nicaragua, 115 miles long and 45 broad, and Managua, 35 miles long and 20 wide. This tableland is also marked by isolated peaks and volcanic cones, as Ometepec, Madera, Guanacaure, Viego, Telica, Momotombo, Mombacho, and others. On the west lie Managua the capital (population 25,000); Leon, Granada, Chinandega, and Rivas, and the harbors of gulf of Fonseca, Salinas bay, and Corinto, and on the east the harbor of

Greytown, on the San Juan river. The principal rivers are the Coco (350 miles), San Juan, Bluefields, and Rio Grande. Minerals are found in the republic, but only of late have they begun to be worked. In 1898, the shipment of gold dust amounted to 16,242 ounces. The rich soil yields corn, sugar, cocoa, cotton, rice, tobacco, and indigo, and the natural products, mahogany, rosewood, logwood, fustic, sandalwood, india rubber, dye woods, medicinal plants, and gums.

Nicaragua was the center of the civilization of the Aztecs, and the unknown race before them. Columbus sailed along the coast in 1502, and in 1524 the city of Granada was founded by Spaniards, who had entered two years before. From 1560 to 1821 the state was a dependency of Guatemala, but in that year became independent and so remained for sixteen years. Then until 1865 it had a troublesome and warlike time, but since then it has made great strides toward peace and prosperity. In 1894, a new constitution was proclaimed, which was amended in December, 1896. By this the legislative power is vested in a congress of one house. Population, including uncivilized Indians, 420,000. See Bancroft's *History of Pacific States.*

Nicara'gua Canal. The plan to cut a ship canal through central America by way of the San Juan river and Lake Nicaragua was taken up in earnest in 1884 and a treaty made between the United States and Nicaragua. The Nicaragua Canal company was formed in 1889 to work under plans made by A. G. Menocal, of the United States navy, giving the canal a total length of 170 miles, 121 miles of it being the free navigation of the river and lake. The canal was begun at Greytown, at the mouth of the San Juan river, in 1889, and it was expected that the work would be completed at a cost of $60,000,000. But after expending $4,000,000, the company found the burden greater than they had anticipated, and sought an appropriation from congress of $100,000,000, with provision for government supervision. Failing in this the work ceased, and finally the concession from the government of Nicaragua lapsed. In 1897, the United States government took up the question of the construction of a canal, and a commission was appointed to make surveys and report upon the most practicable route, and estimate the cost of constructing the canal. In 1899, a new commission was authorized to make further inquiry and report, considering both the Nicaragua route, and the Panama route. The Nicaragua route was recommended, and the cost of canal was estimated at from $118,000,000 to $135,000,000. In 1900, a treaty was negotiated between the United States and Great Britain, with the view of facilitating the construction of the canal, and removing the objections to it arising out of the historic Clayton-Bulwer treaty. This treaty failed of confirmation by the United States' senate, and a new treaty is now being considered.

Nich'olas I. was born of noble Roman parentage, and elected pope in 858 A. D. He was zealous in upholding the power of the Roman curia (court of justice). He died in 867.

Nich'olas I., emperor of Russia, third son of Paul I., was born at St. Petersburg, July 7, 1796; was carefully educated, and later devoted his time to military studies and political economy. He traveled over Europe, and after marrying the eldest daughter of Frederick Wilhelm III. of Prussia, and upon the resignation of his elder brother, Constantine, he ascended the throne in December, 1825. In 1828, the war with Persia began, and on its close occurred the war with Turkey. This was followed by the rising of Poland, which he subdued, and reduced the kingdom to a mere province. His rule now

Nice (*nēs*), a French seaport and the largest town of the Alpes-Maritimes department of France, lies on the coast 140 miles from Marseilles. Owing to its southern sea exposure and shelter by the hills on the north, it has long been a famous winter resort for invalids. The city is divided into three parts—the New Town, Old Town, and the Port. The chief public buildings are the cathedral, Church of Nôtre Dame, natural history museum, art gallery, library, observatory, and casino. Its main export is olive oil. The town was founded by a colony from Massalia and became subject to Rome in the 5th century B. C. It was once in the hands of the Saracens, and after being an independent city acknowledged the counts of Provence and the house of Savoy in 1388. In 1543, it was pillaged by the Turks, and in 1860 was finally ceded to France by Sardinia. In 1887, it was visited by a destructive earthquake. Population 93,760. See Nash's *Guide to Nice.*

became despotic and fierce. He remained inactive until the Austro-Hungarian rebellion in 1848–9, when he was called in to aid Austria. This strengthened him with the European powers and he began to think of absorbing Turkey. The opposition of the western powers led to the Crimean war, during which he died at St. Petersburg, March 2, 1855.

Nich'olas II., czar of Russia, born at St. Petersburg, May 18, 1868; succeeded to the throne Nov. 1, 1894, on the death of his father, Alexander III. He married Princess Alix, of Hesse-Darmstadt, granddaughter of the late Queen Victoria of England, Nov. 26, 1894. His reign has been marked by the construction of a railroad through Siberia to the Pacific coast, by adroit diplomacy with China, and by a strong and conservative attitude toward Turkey, as well as toward the European powers.

Nich'olas V., Pope of Rome, 1447–55, was born at Pisa, in 1398, and died in 1455. He was liberal to scholars and artists, and practically founded the Vatican library.

Nich'olas, St., the patron saint of Russia, whose life is wrapped in obscurity. He is supposed to have lived about 300 A. D. He was bishop of Myra, in Lycia, and was imprisoned under Diocletian and released under Constantine. In Catholic countries St. Nicholas is especially the patron of the young, and particularly of scholars. In England, his feast was publicly celebrated in ancient times. Santa Claus is a corruption of the name, introduced into England from America; the old Dutch settlers of New York kept a San Claus holiday. St. Nicholas was also the patron of merchants, sailors, and travelers; and as he was prayed to for protection against robbers, the term "clerks of St. Nicholas" came, oddly enough, to be a cant name for robbers.

Nicias (*nish'i-as*), an Athenian statesman and general of the Peloponnesian war, was the son of the wealthy Niceratus. After the death of Pericles, he was the political opponent of Cleon, and later of Alcibiades. In 427 B. C., he defeated the Spartans and Corinthians, and ravaged Minoa, Melos, and Locris. In 424, he ravaged Cythera and part of Laconia. In 415, he was appointed one of the commanders against Sicily, and in the autumn laid siege to Syracuse. At first successful, later his fleet was destroyed, his army began a retreat, and he was captured and put to death in 413 B. C. See Plutarch's *Life of Nikias* (edited by H. A. Holden).

Nick'el, a malleable, ductile, and tenacious grayish-white metal, was discovered by Cronsted, in 1751, but was long before that time used in alloys by the Chinese. Yet previous to 1879, it being difficult of fusing, was only used as an alloy in German silver. In that year Fleitmann discovered that mixed with ⅛ of one per cent. of magnesium it could be easily rolled and drawn. The metal does not readily alter by exposure, but it easily dissolves in nitric acid. It is now used as an alloy with copper and zinc in German silver and is largely used for plating articles of iron and steel. In some alloys it is used for coins. It is also extensively used in steel for armor plates, cannon, etc. The ore, in different forms, is found in Canada, Norway, Germany, Hungary, France, and in the United States.

Nic'otine. See POISONS.

Niebuhr (*nē'bör*), **Barthold Georg**, a distinguished modern historian, was born at Copenhagen, Aug. 27, 1776. After careful study at Kiel, he devoted himself to the study of natural sciences at London and Edinburgh. In 1800, he married and entered the Danish state service, from which he resigned in 1806, to enter the Prussian state service. From 1810 to 1812 he gave a course of lectures at the new University of Berlin on Roman history. From 1816 to 1823 he was German ambassador to the papal court. He died at Bonn, Prussia, Jan. 2, 1831. Some of his works are *Lectures on the History of Rome*, *Lectures on Ancient History*, and *History of Byzantium*.

Niemen (*nē'men*), a river in western Russia, rises a few miles south of the city of Minsk, divides into two branches below Tilsit, and empties into Kurisches Haff by four mouths to each branch. It is 500 miles long and navigable as far as Grodno.

Ni'ger, the name generally applied to a remarkable river system of west equatorial Africa, whose main features have as yet been but partially settled by exploration. It was thought to be a tributary of the Nile; then of the Congo, and then supposed to terminate in an inland basin; but the work of Mungo Park and others have settled all but 70 or 80 miles of its length. The Niger proper is 2,600 miles long and its drainage basin has an area of 1,023,280 square miles. The headwaters are in the present states of Samory, near the headwaters of the Senegal; but the Tembi, rising in the Loma mountains, 3,000 feet above the sea, is the actual source. From the source to Timbuktu, the river has only a few small tributaries, but some distance below here it is joined by the Benuë, or mother of waters, traveling 860 miles from the east. Thence the river flows to its mouth, where a beautiful delta is formed. The navigation is free, but the trade, chiefly in palm oil, is under the control of Great Britain. See Joseph Thomson's *Mungo Park, and the Niger*.

Niger'ia, Northern and Southern (formerly the Niger Territories, until Jan. 1, 1899, administered by the Royal Niger company, but now under the control of the British Crown, along with Lagos colony). Nigeria covers an area in western Africa roughly estimated at between 400,000 and 500,000 square miles, with a population placed at from 25 to 40

millions. For administrative purposes this vast region is divided into two governments, those of Northern and Southern Nigeria. They embrace the area once the Fula or Sokota empire, with the subordinate sultanates of Gandu, Kano, Bornu, Benin, Donga, etc., watered by the Niger and its tributaries. On the gulf of Guinea, the territories have a seaboard of about 120 miles in length, on which are the towns Akassa, at the mouth of the Niger, the British naval headquarters; Bonny, Wari, Old Calabar, and New Calabar. A military force is stationed in southern Nigeria, partly at Asaba, and partly at Akassa. The capital of Northern Nigeria remains for the present at Jeba, though it is designed to create a new one in the direction of Kano, eastward toward Bornu, in a healthier and higher region more suitable for Europeans. The chief products of Nigeria are rubber, gum, hides, ivory, palm oil, and palm kernels. Northern Nigeria is rich in agricultural resources, cotton being largely grown and now manufactured. Here are found the Hausa race, who carry on the internal trade by means of caravans in Central Sudan.

Night'hawk, an American insect-catching bird related to the whip-poor-will. It is quiet all day but flies at dusk and is often called the bull-bat. It is common in many parts of the United States from May to October, and may be seen at nightfall, high in the air, sailing back and forth in search of flying insects. It is about ten inches long, of a dark color mottled with gray, and can always be recognized from the white spot on each of the long wings.

Night'ingale, a bird famous on account of its brilliant song, which for quality and variety is not exceeded by that of any other bird. The song of the nightingale has been a theme of poets for ages. This bird belongs to the group of the Old World warblers and is not found in the new world. It lives in the dense undergrowth and warbles at all times of day as well as at night. It should be remembered that there are also other birds that sing at night. The bird is about the size of the hedge sparrow. It is dull brown above, lead shading into grayish below. It is of graceful form, but otherwise plain. The so-called Virginia nightingale is the cardinal bird.

NIGHTINGALE.

Night'ingale, Florence, an Englishwoman philanthropist, daughter of William Edward Nightingale, was born at Florence in May, 1820, and during the course of her study of science, mathematics, and classics, with her father, showed a great desire to lessen human suffering, so much so, that in 1844 she began a tour of Europe, looking into the condition of hospitals, and in 1851 entered upon a course of study as a trained nurse at Kaiserwerth on the Rhine. On Nov. 4, 1854, the year of the outbreak of the Crimean war, she arrived at Scutari with thirty trained nurses and took charge of the military hospitals until the close, in July, 1856. She then turned her attention to the improvement of the sanitary condition of the army, and wrote many books and papers on that and kindred subjects, among them *Notes on Nursing*, *Notes on Hospitals*, *Life or Death in India*, etc. She is the founder of St. Thomas' Home in London for the training of nurses, and the recipient of a cross from the late Queen Victoria, and a bracelet from the sultan of Turkey. Longfellow praised her in *Santa Filomena*.

Night'shade, the name of a plant possessing narcotic properties. It has a slender stem, pointed oval leaves, white clustered flowers, and small, rounded, black berries. It is found diffused over all the world, and its leaves have the property of putting to sleep, though losing it when boiled. The several kinds of nightshade are known by different names—the woody nightshade as "bittersweet," deadly nightshade as "belladonna," and enchanter's nightshade as "circæa."

Ni'hilist, now used as designating a Russian revolutionist. It was first so introduced by Turgenieff, who defined a nihilist as one who "bows before no authority of any kind, and accepts on faith no principle, whatever veneration surround it." The nihilist believes in no institution of government, progress, or art, unless it be by and for the benefit of the masses. The movement with which the nihilist is identified had its origin in 1860, when the proposed freeing of serfs was prevented by the influence of the serf-owners with the czar. From this time the peasants organized societies to force the adoption of a new constitution, and in their efforts resorted to violence repeatedly, going so far as to kill the czar Alexander II., March 13, 1881. For alleged crimes, previous to this, hundreds were sent to Siberia in exile, while for the murder of Alexander II., many were hanged and hundreds exiled. The present czar, Nicholas II., lives in considerable dread of the nihilists, and may be said, in some measure, to be a prisoner in his palace, as outbreaks of the nihilists are frequent. See *Russia and the Siberian Exiles*, by George Kennan.

Nikko (*nēk'kō*), one of the chief religious centers of Japan, is beautifully situated in the Nikko Zan ("Mountains of the Sun's Brightness"), about eighty miles northwest of Tokio. A Shinto temple seems to have existed at Nikko from time immemorial, and in 767 its first Buddhist temple was founded; but the main celebrity of the place is due to the sepul-

chres and sanctuaries of Iyeyasu and Iyemitsu, the first and third shoguns of the Tokugawa dynasty. Iyeyasu was buried here with amazing pomp in 1617. His tomb lies forty steps higher up the hills than the numerous magnificent temples and other structures which cluster around it. Above the tomb, the hill on which it stands is covered to the summit with trees of various tints, while below are a vast number of temples, shrines, pagodas, monuments and religious edifices of all kinds, to which thousands of pilgrims resort every year, and by whose gifts Nikko has been thus beautified, making it one of the most attractive spots in all Japan, in addition to being the great sanctuary of the Shinto cult.

Nile, a great river of Africa, the ancient Nilus, the longest river of the world, and the sacred river of the Egyptians. It has its source at the north end of Lake Victoria Nyanza, and pouring over the Ripon Falls, runs 300 miles to join Albert Nyanza, 20 miles from which it falls 120 feet into a deep gorge, and flows in a northerly direction into the Mediterranean. At 7½° N. latitude the channel is divided in two, only to join again at 9½°, to be called the White Nile, flowing thus to Khartum, where it is joined by the Blue Nile, 950 miles long. These augmented waters flow for 200 miles before they are joined by the Black Nile. Below Khartum the navigation is impeded and dangerous on account of six rapids. The Nile begins to rise in April and reaches the highest point in September, often causing disastrous floods. The ancients believed that the river rose in Morocco and flowed underground for several days' journey, rising to the south of Ethiopia, thence passing northward. The Emperor Nero first began the investigations of the source of the river by sending out two expeditions, but they were not completed in their present form until the explorations by Speke in 1858, by Baker and Schweinfurth in 1868–71, and by Stanley in 1875 and 1889. The total length of the Nile from Victoria Nyanza to the Mediterranean is 3,400 miles, although it is believed that the river actually draws its water as far as 250 miles to the south of Victoria. See the writings of the explorers named.

Nile, Battle of the, was fought Aug. 1, 1798, in the bay of Abukir, at the mouth of the Nile, 13 miles northeast of Alexandria. Nelson gained a great victory over the French fleet, which was not only defeated, but almost annihilated; the flagship of the Admiral De Brueys blew up, and only two ships escaped. In 1799, Napoleon defeated a Turkish army here, and in 1801 Sir Ralph Abercromby's British expedition landed in the face of the enemy, and here he met his death.

Nil'sson, Christine, a Swedish prima donna and operatic singer, was born near Wexio, Sweden, Aug. 3, 1843. A magistrate was impressed by her singing at a fair, in 1857, and sent her to Stockholm and Paris for a musical education. She appeared first in Paris in *La Traviata* in 1864, and in London in 1867, and was soon ranked among the foremost singers on the modern stage. In 1872, she married M. Rouzaud, and in 1887 the Count di Miranda.

Nimes (*nēm*), the capital of Gard, a French department, lies in the valley of the Cevennes. It has narrow, crooked streets, and its principal interest lies in the Roman remains; there being the Corinthian Maison Carrèe, now a museum; an amphitheatre seating 20,000; a mausoleum, baths, and two gates. The city is the seat of large manufactories of silk, cotton, carpets, shawls, wine, brandy, etc. Nimes was settled from Marseilles and became one of the great cities of Gaul. It was in the hands of the Visigoths (465), Franks (507), Saracens (725), then belonged to Aragon, but finally came into the possession of France in 1259 by the treaty of Corbeil. Population 74,601.

Nin'eveh, the famous capital of the Assyrian empire, called Ninâ on the monuments, now a mass of ruins called Kuyúnjik. Though the city appears to have been entirely destroyed in the fall of the empire, the name of Nineveh continued, even in the middle ages, to be applied to a site opposite Mosul, on the east bank of the Tigris, where artificial mounds and traces of an ancient city wall, gave evidence of fallen greatness. The walls inclose an irregular figure, stretching about two and one-half miles along the Tigris, which protected the city on the west. The greatest breadth is over a mile. The most elaborate defenses, such as outworks and moats, can still be traced on the southern half of the east side; for this part of the city was most open to attack. It was not until the excavations of Botta, in 1842, and of Layard, in 1845, that anything definite was learned of the life and history of Assyria from its monuments and library. Not only have the magnificent remains of Assyrian architecture and sculpture been laid bare, but accompanying cuneiform inscriptions throw much light on the history of the city and its buildings. The mound of Kuyúnjik covers the palaces of Sennacherib and Assur-banipal, that of Jonah, a second palace of Sennacherib, and one of Esarhaddon. Of other remains, the most striking is the gateway near the center of the north wall, consisting of two halls, 70 feet by 23, the entrance to which, toward the town, was flanked by colossal man-headed bulls and winged human figures. Nineveh proper was only one of a group of cities and royal residences whose ruins still mark the plain between the Tigris, the Great Záb, and the Kházir. Nineveh proper appears to have been the chief seat of empire. But when the book of Jonah speaks of Nineveh as a city of three days' journey,

it is plain that the name is applied to the whole group of cities between the Tigris and the Zâb. See works of Layard, Botta, Flandin, Schrader, and Keilinsch. See also *Assyrian Discoveries*, by George Smith.

Ning-Po' ("City of the Hospitable Waves"), a treaty port of the province of Che-Kiang, in China, lies 16 miles from the mouth of the Ning-Po river; is surrounded by a wall 25 feet in height and 16 in thickness. It is a free port, exporting sedge hats, green tea, mats, cuttlefish, silk goods and raw cotton, and importing opium, cotton and woolen goods, tin and iron, kerosene oil, sugar, tobacco, and indigo. Population 255,000.

Niobe (*nī'ō-bē*), according to Homer's story of mythology, was the daughter of Tantalus and wife of Amphion, king of Thebes, to whom she bore six sons and six daughters. She was proud of her children, and despised Latona, who had only two. For this, Latona caused her children to slay all Niobe's with arrows, and Niobe herself was turned into stone on Mount Sipylus, from which tears flowed all summer. A statue group of Niobe and her children was discovered in Rome in 1583.

Nip'igon, a lake, and also a river and a bay, through which river and bay the waters of the lake flow to Lake Superior from the north. The lake lies about 25 miles north of the northernmost part of Lake Superior. It is 70 miles long from north to south, and 45 miles wide from east to west. It is surrounded by lofty shores, abrupt and precipitous in many places. Its shores being indented by many bays measure, it is estimated, nearly 600 miles in extent. It lies about 800 feet above the level of Lake Superior. Its waters are fed by many mountain streams, and being very deep and cold it is celebrated for the excellence of its fish. Being thickly studded with islands, it has become a favorite resort for sportsmen and others from the northern United States. It is said to have in January a mean temperature of but seven degrees above zero, or that of Godthaab in Greenland, and in July the mean temperature of San Francisco. By some authorities the name is spelled Nepigon.

Nippur, a city of Babylonia, situated between the Tigris and the Euphrates rivers, in the neighborhood of 100 miles southeast from Bagdad, and about 50 miles from the site of ancient Babylon. The mound which covers the ruins of the ancient city was first made the object of study by Sir Austen Layard in 1851. The expedition sent out by the University of Pennsylvania began work upon this mound in February, 1889. The excavations so carried on revealed the site of a city of great importance, one of the chief commercial and military centers of the ancient east. Professors Petrie and Hilprecht hold that the lowest remains exhumed indicate a city built at least 7000 B.C., and possessed of a well-developed civilization. It is thus shown that Babylonia was old before Egyptian civilization had acquired its characteristic features. Written records discovered carried the date of documents further back than ever before. The Temple of Bel, whose site was exhumed in Nippur, held the same relation to that city and its surrounding country that the Holy House did centuries later to Jerusalem. The University of Pennsylvania possesses a large and important collection of relics brought from this site.

Ni'ter. See SALTPETER.

Ni'tric Acid (HNO_3), is one of the most important acids. It was formerly, and sometimes is still, called *aqua fortis*. It is prepared by distilling a mixture of saltpeter, usually the cheaper Chile variety (sodium nitrate), with sulphuric acid. The strongest nitric acid is about half again as heavy as water, and is an intensely corrosive liquid, which is colorless when pure, but is usually colored yellow by the presence of lower oxides of nitrogen. It fumes in the air, colors the skin yellow, producing painful burns, and dissolves, usually, or oxidizes, all the commoner metals except gold and platinum, with the violent expulsion of choking red fumes. Aluminum is dissolved but slowly by it, and in some instances the strong acid must be diluted with water before it will act upon a metal. Dilute nitric acid is generally less active the more water it contains. Strong nitric acid, mixed with sulphuric acid, acts upon cotton and glycerine to form the explosives, guncotton and nitroglycerin. Nitric acid is extensively used in chemical operations, particularly to dissolve metals and to oxidize substances. When the metals or their oxides or carbonates dissolve in this acid, salts called nitrates are produced. Mixed with hydrochloric acid, nitric acid forms *aqua regia* (royal water), which is capable of dissolving gold and other substances that are not attacked by a single acid. Nitric acid is also used to some extent in medicine. HORACE L. WELLS.

Ni'trogen is an elementary gas which in the free state forms nearly four-fifths by volume of our atmosphere. In combination with other elements, nitrogen is a necessary constituent of all plants and animals, and it forms a very large number of important compounds, both natural and artificial. Its presence in the atmosphere was discovered in 1772 by Rutherford, at that time professor of botany in the University of Edinburgh. It was more particularly, investigated soon after by Priestley, Scheele, Cavendish, and Lavoisier. It is a colorless, tasteless, odorless gas, and was formerly regarded as permanent and incondensable; but it can be liquefied at a sufficiently low temperature. Nitrogen is slightly lighter than atmospheric air, and is fourteen times as heavy as hydrogen. It is but slightly soluble in water, one hundred volumes of

water at ordinary temperature dissolving only one and a half volumes of nitrogen.

While nitrogen is a constituent of all plant and animal organisms and of many important compounds, it is, in a free state, rather inert toward other elements and does not readily enter into direct combination with them. It is not combustible, nor does it act in the atmosphere as a supporter of combustion, as a lighted taper plunged into a jar of nitrogen will be at once extinguished. Nitrogen is not poisonous, since it is breathed freely along with oxygen by all animals; but it cannot support life, and an animal placed in it will die from suffocation for want of the oxygen necessary for breathing. Its function in the atmosphere seems to be mainly that of diluting the oxygen with which it is there associated. Although nitrogen forms about 79.1 per cent. of the total volume, and 77 per cent. of the total weight of the atmosphere, the free gas cannot be taken up by plants directly, but it is combined with other elements through the agency of certain bacteria that exist in nodules on the roots of leguminous plants, that is, those that are related to clover, peas, etc. Other plants, particularly grasses and grains which require much nitrogen, are dependent upon the combined nitrogen of the soil; hence nitrogenous fertilizers such as dried blood, ammonium salts, and nitrates, as well as ordinary manures, are important in agriculture for use on soils containing insufficient nitrogen. Two of the important compounds of nitrogen are nitric acid and ammonia. This element is also an essential constituent of the proteids or albuminoids, which make an important part of our food, as well as of the alkaloids, most of the dyes, and a host of other natural and artificial compounds. H. L. WELLS.

Ni'troglyc'erin, a powerful explosive, is formed by dissolving glycerin in equal parts of nitric and sulphuric acids and pouring into water. The process was discovered in 1846 by an Italian chemist named Sobrero, but it was not used for blasting purposes until Nobel, a Swedish engineer, used it in 1861. The danger of explosion was so great in handling it that its mixture with powdered substances, especially dynamite, are now chiefly used. If lighted in the open air it will burn usually slowly without an explosion, but if given a hard blow or brought into contact with a red-hot iron it will explode. It begins to decompose at 150° to 180° F., and explodes at 450°, also if allowed to become solid at from 40° to 45° F.; a breaking of the crystals in this form may cause an explosion. It has thirteen times the power of the same bulk of gunpowder and eight times the power of the same weight. It is also used in solution for treating some diseases of the heart and stomach.

No'ah, the son of Lamech, and the tenth in descent from Adam. According to the Scripture narrative, he was the only righteous man in the world immediately prior to the flood. God therefore warned him of the coming deluge and gave him instructions for building the ark, which was to shelter all who survived it. While the ark grew under his hands, Noah tried to persuade his fellowmen to repentance, but in vain. When the ark was finished, he entered it with all his family and one pair of all kinds of animals. The flood came and all living things outside of the ark perished. After the rain ceased and the waters sank, the ark rested on Mount Ararat, in Armenia. Here Noah offered a sacrifice to the Lord, which was accepted, God making a covenant with Noah and confirming it with the sign of the rainbow in the clouds. The traditions of other nations coincide with the biblical history of this event. (See DELUGE.) Noah died at the age of nine hundred and fifty years.

Node, the distinct joint formed by stems from which the leaves and branches arise. The portions of the stem between the nodes are known as internodes.

Nor'dau, Max Simon, a Hungarian physician and author, was born at Budapest, July 29, 1849, of Jewish ancestry. He came into public notice by his work entitled *Degeneration*, published in 1895, in which he argued powerfully in defense of the proposition that the occidental nations are degenerating, morally, mentally, and physically. He held that in politics, society, and faith, the age is thoroughly decadent. The work evoked many replies, which kept it continually before the public. He had been writing for almost twenty years before, but only a few of his volumes had been translated into English. The best known of his works are *Paris Pictures*, *Conventional Lies*, *Paradoxes*, and *The Malady of the Century*. Since the publication of *Degeneration*, he has issued *The Comedy of Sentiment*, *The Right to Love*, *The Drones must Die*, with others of limited circulation.

Nordenskjold (*nor-dĕn-sheld*), **Nils Adolf Erik,** Baron, an arctic explorer, was born at Helsingfors, Finland, Nov. 18, 1832. He furthered the acquired taste for geology, chemistry, and mineralogy by studies at home and in Berlin. He was naturalized in Sweden in 1857, and in 1858 was made head of the mineralogical department of the royal museum at Stockholm. He mapped the south of the island of Spitzbergen, and after two trips

BARON NORDENSKJOLD.

to the mouth of the Yenesei, he completed the navigation of the northeast passage from the Atlantic to the Pacific, from June, 1878, to September, 1879, in the *Vega*. On the last of his two voyages to Greenland, in 1883, he traveled 140 miles from the east coast. He was made a baron in 1880. and has written *Voyage of the "Vega" round Asia and Europe*, *Scientific Results of the "Vega" Expedition*, and *Studies and Investigations*. See A. Leslie's *Arctic Voyages of A. E. Nordenskjöld*.

Nord'hoff, Charles, an American author, was born at Erwitte, Prussia, Aug. 31, 1830. He came to the states with his parents when a child of five years, and was educated at Cincinnati. He entered the United States navy in 1844, and during a service of three years made a voyage around the world. He afterward joined the commercial marine, remaining at sea most of the time until 1835, when he became a journalist, first at Philadelphia and later at Indianapolis. From 1861 to 1871 he was editorial writer for the *New York Evening Post*. The next two years he spent in travel through California and the Hawaiian islands. He then became Washington correspondent for the *New York Herald*. His principal works are, *A Man of War Life*, *The Merchant Vessel*, *Whaling and Fishing*, *Stories of an Island World*, *Cape Cod and All Along Shore*, *California*, *Politics for Young Americans*, *The Communistic Societies of the United States*, etc.

Nor'dica, Lillian, the stage name of Mrs. Zoltan F. Döme, an American prima donna, who was born at Farmington, Me., in 1859. Her earlier musical education was pursued at the New England conservatory, Boston, and her later studies at Milan, Italy. She made her debut as an opera singer at Brescia, Italy, in *La Traviata*. In 1887, she appeared in London with marked success, following up her triumphs in Paris, by others at St. Petersburg and various European capitals. Mme. Nordica has sung leading parts in forty operas and in all the standard oratorios. She was married first to a Mr. Gower; second to Herr Döme.

Nor'folk, a city and port of Virginia, stands on the right bank of the Elizabeth river, about eight miles from Hampton Roads. It is built irregularly on low ground, but has a large, deep harbor, defended by Fort Calhoun and Fortress Monroe. The city contains a city hall, mechanics' and masons' hall, custom house, military academy, and seminary, and ships cotton, oysters, and early fruits. The place was burned by the British in 1776, and was the scene of the battle between the *Monitor* and *Merrimac*. Population 46,624.

Nor'mal Schools are institutions for the especial instruction of teachers in the art and practice of their profession. The same schools in England are called training colleges. Students are admitted who have passed through the curriculum of any good grammar school, and who are between seventeen and twenty years of age; although in some schools candidates for entrance may be older. What was practically a normal school was opened in Edinburgh in 1830. Battersea training college is the oldest normal school in England, but it has about fifty successors now. Most normal schools in the states are modeled after those of Massachusetts, while those of Massachusetts take the Prussian schools as their models, with such adaptations as the state of education and society in our country necessitates. The oldest normal school in Massachusetts was established at Lexington in 1839. The latest statistics given by the Bureau of Education place the number of public normal schools at 167; and give the number of private normal schools as 178. In all these there are about 2,900 teachers and 68,000 pupils. In the public normals the proportion of female students is nearly three times that of the male students; in the private schools the sexes are nearly equal. About 3,000 negroes are pursuing normal courses. Sixty-one per cent. of those in normal schools are in teachers' training classes. Apart from studies bearing directly upon pedagogy the course of studies embraces those usually pursued in English high school courses.

Nor'man, Henry, an English journalist, was born at Leicester, England, Sept, 19, 1858. He studied, however, in this country, graduating from Harvard college in 1881, and passing the next two years at Leipsic, Germany. He then accepted a position on the *Pall Mall Gazette*, London, and later became associate editor of the *Daily Chronicle*. He was several times sent abroad upon important missions on account of his proficiency in modern languages. Having inherited a moderate fortune in 1888, he spent the following years in travels throughout the least known parts of Asia. He has published works upon *China*, *Corea*, *Japan*, *Siberia*, and the *Balkans*. His first book was an account of *The Harvard Greek Play*, in 1881. In 1895, he was sent to Constantinople to report upon the Armenian massacres; and from there he proceeded to Washington, D.C., to write for the London *Daily Chronicle* the status of the Monroe Doctrine. He married in London (1891) Miss Menie Muriel Dowie, who had previously published (1890) *A Girl in the Carpathian Mountains*, to secure material for which she had traveled in male attire through the wildest districts of the country described. He has published in recent years *The Real Japan*, *The Peoples and Politics of the Far East*, and *The Near East*.

Nor'mandy, an ancient province of France, bordering on the English channel, comprises at present an area of about 10,500 square miles, divided into the departments of the *Seine-inférieure*, *Eure*, *Orne*, *Calvados*, and *Manche*. The soil is fertile and the popula-

tion about 2,500,000. The present inhabitants are lineally descended from the ancient Normans, whose duke, William the Conqueror, in 1066, invaded England and established his dynasty upon the throne of that country. England and Normandy were thus under the same rulers until 1204, when Philip Augustus conquered Normandy and made it a part of France. It was reconquered by the English in 1415 at Agincourt, but again wrested from them by Charles VII. in 1449. The people are hardy, industrious, and exceedingly proud of their history. Their language and their art have left abiding evidences of their value upon the literature and architecture of France. The chief city of the region is Rouen (population 113,219).

Nor'mans. See NORTHMEN.

Norns. The fates of Scandinavian or Norse mythology were three maids named Urd, Verdandi, and Skuld, meaning past, present, and future. They were supposed to sit by the well of Urd, under the world tree in Asgord, and determine the fate of gods and men. There were also lesser norns, all working on the destinies of man.

Nor'ristown, a city, the capital of Montgomery county, Pa., stands on the left bank of the Schuylkill, 17 miles from Philadelphia. It contains a marble court house, a state insane asylum, cotton mills, woolen factories, rolling mills, foundries, flour mills, and glass and tack factories. Population 22,265.

North Adams, a manufacturing town of Massachusetts, is situated on the Hoosac river, near the west end of the Hoosac tunnel, 143 miles from Boston. It has large cotton and woolen mills, shoe and print factories, and foundries. Population 24,200.

North Cape, the extreme north point of Europe, is not on the continent, but is a promontory on the island of Magerŏe. The continental extremity is Cape Nordkyn, six miles south and 45 miles east of North Cape.

North Car'olina, one of the original states of the United States, lies on the Atlantic seaboard, directly below Virginia, and has an area of 52,250 square miles, that is, 7,000 square miles larger than Pennsylvania. The western part of the state is low and often marshy, rising gradually to the North Carolina mountains in the west, with Mount Mitchell (6,707 feet) for their highest point. The state's wealth is mineral; silver, lead, zinc, copper, plumbago, iron, corundum, and mica being found in almost all localities in large deposits. Agriculture is also an important interest, large crops of corn, cotton, wheat, oats, hay, tobacco, and sweet potatoes being produced. From the extensive forests of long-leaved pine, large quantities of tar, resin, and turpentine are shipped every year. The capital is Raleigh, and the other larger cities are Wilmington, Greensboro, Asheville, and Charlotte City. Sir Walter Raleigh first placed colonies in the state in 1585–86–87, but none became permanent. In 1653 a settlement was made on the Roanoke and Chowan rivers by colonists from Virginia, and in 1664 it was severed from Virginia by Governor Berkeley. It became a royal province in 1729, and so remained until May 20, 1775, when it declared its independence, and was the twelfth state to ratify the constitution. It was the last of the eleven states to secede from the Union in 1861. Population 1,893,810.

North Dako'ta, a northwestern state in the Union, was originally a part of the Louisiana purchase, bought from Napoleon by the United States in 1803. Since then it has belonged to the territories of Missouri, Michigan, Wisconsin, Iowa, Minnesota, and then of Dakota from 1868 to 1889, when North and South Dakota were admitted as states into the Union. It has a land surface, approximately, of 70,195 square miles, or nearly double the area of Indiana. North Dakota is called the Sioux state, or the land of the Dakotas, because the Dakota Indians who lived and ruled here were called by a name which the French traders rendered Sioux. The first settlement in the territory was made by French traders, in 1780, at Pembina. In 1875, there were less than one thousand white inhabitants in all North Dakota. The state has now 55 counties, 493 post-offices, 2,100 miles of railroad, 1,485 public schools with 36,000 children enrolled, 119 newspapers and 25 national banks in the area above stated. Fargo, Grand Forks, Bismarck, the capital, Jamestown, Wahpeton, Valley City, and Grafton are the chief cities. James River valley is noted as the wonderful artesian belt. Red River forms the eastern boundary of the state almost entirely, and thousands of logs from the Red lake and Otter Tail pineries are floated down to the Grand Forks sawmills. The land of North Dakota is fertile, the Red River region, a vast deposit of rich black loam, being noted for its bonanza wheat farms. The Dakotas rank high among the wheat-producing states, and the quality of the wheat is the best. Devil's Lake, called Spirit Water by the Indians, is 55 miles long and six miles wide. The Turtle mountains, which extend from Manitoba, cover 800 square miles of surface, the highest peaks being Butte St. Paul, and Bear Butte, 2,300 feet high. On the Little Missouri are the Bad Lands, 30 miles wide and 50 miles long, with huge pyramids, domes, towers, and spires of rocks and colored clays. The clay hills have been changed into terra cotta by the great beds of coal, which have been burning for ages, and are still burning in some places. The treeless region between the Missouri and James rivers is a stretch of ridges and fantastic shaped hills, crowned with masses of bowlders. The Missouri, which bends around through a great part of the state, is navigable

for steamboats for 1,200 miles. The main industry is farming; besides wheat, the chief product, corn, oats, barley, rye, and potatoes are raised. The entire western part of the state is a coal region, and the mines at Dickinson and Burlington, Minot and Sims, do a large business in coal every year. Population 319,146.

North, Frederick, eighth Lord North and second earl of Guilford, an English statesman, was born April 13, 1732, and educated at Oxford. He entered the house of commons at the age of twenty-two, and was made lord of the treasury in 1759. In 1767, he was appointed chancellor of the exchequer and leader of the house of commons, being there opposed to Fox and Burke. In 1770, he became prime minister, and his course, to a large extent, caused England to lose America. He resigned in 1782, and became blind five years before his death, which occurred Aug. 5, 1792.

North Sea or **German Ocean** is the southern arm of the Arctic ocean, lying between Iceland and Norway. It communicates with the Atlantic through the English channel and straits of Dover on the south, and by Pentland Firth and the Orkney and Shetland channels on the north, and with the Baltic through Skager-Rack and Cattegat. It is over 600 miles long and 400 miles wide, and has an area of 180,000 square miles. The sea is in most places quite shallow, averaging 61 fathoms, but on the Norwegian coast is 360 fathoms deep. It is the receptacle of the waters of the Thames, Ouse, Humber, Tyne, Tweed, Forth, Tay, Scheldt, Rhine, Weser, and Elbe. The water is probably the least salty of any of the large seas, and, except in the summer, is warmer than the surrounding atmosphere. The tides are irregular, having a large ebb and flow in some places, while it is hardly perceptible in others. The North sea has long been one of the commercial highways of the world, and affords a valuable fishing-ground.

Northamp'ton, the capital of Northamptonshire, England, is a municipal county and parliamentary borough, and lies on rising ground on the left bank of the river New. It is the center of the boot and shoe industry of England, and has extensive breweries. The city was burned by the Danes in 1010, rebuilt by Simon de St. Liz in 1075, besieged by the barons against King John in 1215, and was the scene of the treaty recognizing the independence of Scotland in 1318. Population about 75,000.

Northamp'ton, the county seat of Hampshire county, Mass., is situate near the left bank of the Connecticut river, 103 miles from Boston. It manufactures paper, silk, cotton, and woolen goods, sewing machines, baskets, cutlery, brushes, and jet ornaments. In the city are the state insane asylum, Clark institute for deaf-mutes, public library, and Smith college for women. Population 18,643.

North'men or **Norse'men** was a name applied in the middle ages to the seafarers who came from Denmark, Norway, and Sweden, and then to those of Norway only. Their passion was sailing and war, and to satisfy it they sailed in all directions to discover and plunder. In plain words, they were pirates, who, during the summer months, visited other lands and preyed upon them, or lay in wait in river mouths, or behind islands, for vessels to attack and pillage. Their age may be divided into two periods, the first lasting to the middle of the 9th century, devoted to murder and plunder, and from then to the 13th century, given to permanent conquest in Ireland, South Italy, England, and France. The first attack was made upon Wessex, in England, in 787, and reached France about the end of the century, and up to 850 they committed most terrible depredations. In 859 and 860, a large fleet entered the Mediterranean and ravaged Spain, Mauritania, and Majorca, spending the winter at the mouth of the Rhône, to begin the attack on Italy in the spring. Thus they subsisted on the entire seaboard of Europe until Charles the Simple concluded a peace, by which they were allowed to settle in France, and gave them the territory between the Channel, the Seine, and the Ept, on the condition that they fought for him and became Christians. The name of Normandy was given to this district, and the Northmen living in it were called Normans. They ruled here from the 10th to the 13th century, when it was taken from them by the king of France, the most illustrious of their dukes being William who became king of England in 1066, with the title of William the Conqueror. The Normans adopted the language and manners of the French, and changed their heathen rites for the Christian religion. The Norsemen, early in the 9th century, had opened the route to the White sea by rounding North cape, and before 1222 had many times sailed up the northern Dwina.

North'west Territories, The, a part of the Dominion of Canada, comprise the provinces of Alberta, Assiniboia, Athabasca, and Saskatchewan, besides an unorganized expanse estimated at 906,000 square miles. The territories named contain about 550,000 square miles with a population of about 145,000, exclusive of 20,000 Indians. All of this region with Manitoba was, up to 1870, under the direct control of the Hudson Bay company, by whom it was treated as a vast hunting preserve. The Northwest territories are presided over by a lieutenant-governor and a legislative assembly, and have an executive council composed of a lieutenant-governor and five members who are elected by the people. The territories are also represented in the dominion parliament by four members.

The seat of their own united government is, since 1883, at Regina (population 2,000), in the Province of Assiniboia. The Canadian Pacific railroad traverses both Assiniboia and Alberta, and branch lines are being rapidly constructed to open up the vast district lying upon either side of the main line. About one half the population is Protestant; about one seventh Catholic, and pagan Indians constitute the remainder. Coal, both anthracite and bituminous, is found in large quantities. Most of this region is susceptible of cultivation and produces all small grains. There is less waste land north of the international boundary than south of it. The country is very rich in natural resources, and despite its severe winters it is destined to be the seat of a large and prosperous population.

North'west'ern University, a Methodist Episcopal institution, is located at Evanston, Ill., twelve miles north of the center of Chicago. It was first opened in 1855. The university comprises the following departments, each having a distinct faculty of instruction: the college of liberal arts, the medical school, the law school, the school of pharmacy, the dental school, the woman's medical school, the school of music. Garrett biblical institute, though under a separate management, is closely affiliated, and serves as the theological school of the university. The university has a permanent productive endowment of $2,950,000, with an annual income, exclusive of benefactions, of $390,000. The value of its buildings and grounds is $2,096,000. The college library contains 45,764 volumes and 30,000 pamphlets. The faculties number 229, and the number of students in degree-conferring departments is 2,246.

Nor'ton, Charles Eliot, an American author and educator, was born at Cambridge, Mass., Nov. 16, 1827. Young Eliot graduated at Harvard college in 1846, and traveled in Europe and the far east for the following two or three years. He spent altogether nine years abroad between 1849 and 1873. In 1864–68, he was joint editor with Lowell of the *North American Review*. In 1874, he was appointed professor of the history of art at Harvard, and in 1879 he became president of the Archæological institute of America, holding that office for eleven years. He received the honorary degree of Lit.D. from Cambridge, England, and LL.D. from Harvard. He has published and edited about 20 volumes. His writings have largely dealt with art and sociology, as in his *Recent Social Theories* and *Historical Studies of Church Building in the Middle Ages*. He has written lives or edited works of *Dante*, *Michael Angelo*, *Carlyle*, *Emerson*, *Lowell*, etc.

Nor'walk, a town of Connecticut, in Fairfield county, at the mouth of the Norwalk river on Long Island sound, 41 miles from New York. It has the largest straw hat factory in the United States and large manufactories of felt hats and goods, woolens, shirts, shoes, locks, door knobs, besides foundries and iron works. It has a good harbor and large oyster fisheries. Population of Norwalk city, 6,125; of South Norwalk city, 6,591 — total, including Norwalk town, 19,932.

Nor'way, the western and northernmost part of the Scandinavian peninsula, united to Sweden only through having a common ruler; it is divided from Sweden by the Keel mountains, which run parallel to the coast from the north to 63° and then separate, the main division continuing to mark the boundary by a plateau from 2,000 to 4,000 feet wide. The higher peaks are Galdhopiggen, Glittertind, 8,379 feet; Snæhaetten, 7,566, and Lodalskaupen, 6,790. Bear, lynx, and deer abound in these mountains, and the only inhabitants are the men and women who tend the large herds of cattle and sheep. On account of the Gulf stream the winter on the west coast is much warmer than in the interior, whereas the summer is much cooler. The largest cities are Khristiania, the capital (population 225,686); Bergen, Trondhjem, Stavanger, Drammen, Khristiansand, and Fredrikstad. The hardiest grains and vegetables flourish, but the occupation of the people is mainly connected with the great fisheries. The mineral wealth of Norway has been practically exhausted since 1870, only a few mines being now worked. Norway is divided into twenty districts (Amter), has an area of 124,445 square miles, and an estimated population in 1900 of 2,231,395. It is nominally a limited monarchy, but actually, to all intents and purposes, is almost a free republic. The head of the government is a king, at present (1901) Oscar II. of Sweden and Norway, but his acts are limited by an appointed executive council of eight and three ministers of state. One of the first peoples to settle Europe, their history does not, however, become free from myth until the 9th century, when the Lapps and Finns were found in the country by the Gothic descendants, who then crossed the Baltic and settled there. For a long time it was a part of the kingdom of Denmark. Her history is intimately associated with that of the Norsemen, who were a part of her people, but from 1130 to 1240 the country suffered both in war and in commerce, and commenced a rapid retrograde movement which did not end until it was attached to Sweden in 1814. All titles of nobility were abolished in 1821, and in the struggle from 1872 to 1884 the right of veto was taken from the king. See Carlyle's *Early Kings of Norway*, and Boyesen's *History of Norway*.

Nor'wich, the capital of Norfolk, England, a municipal county and parliamentary borough, lies on the Wensum, 114 miles from London, and covers an area of about 10,000 acres. It contains Pull's ferry and Bishop's

bridge (1295), St. Giles' hospital (1249), Ethelbert gateway (1300), Guildhall (1413), the music house, Bridewell and Dolphin inn, — all old buildings. It also has a cathedral, founded in 1096, which has a spire 315 feet high. The principal manufactures are crapes, mustard, starch, ironware, and boots and shoes. The city in olden times was often plundered by the Danes, then burned by Sweyn and held by Canute. It has been the seat of sixty-five bishops. Population about 110,000.

Nor'wich, county seat of New London county, Conn., stands at the head of the Thames river, the chief portion of the town lying on an eminence between the Yantic and Shetucket rivers, which here unite. It manufactures paper, cotton, and woolen goods, cords, pistols, wood type, files, locks, iron pipes, and has large rolling-mills and iron works. The land on which it stands was given to an Englishman by Uncas, the chief of the Mohicans, in 1656. Population 17,251.

Nose, the external organ containing the nostrils and connected with the sense of smell. Many lower animals possess the power of smell but have no nose. The nose proper begins in the vertebrate animals. The nostrils serve as paths for air into the respiratory passages. They lead also into the chamber of the nose, which is divided by a flat bony partition into right and left sides. The walls of each cavity are convoluted (*turbinated bones*), and covered with a soft membrane from which the nerves of smell pass to the brain. The sense-cells, which are especially modified for smelling, are located in the membrane, and the nerve fibers forming the olfactory nerve grow from them. The olfactory nerve usually enters into an olfactory lobe before making connection with the brain.

Not'ting'ham, the capital of Nottinghamshire, England, a municipal county and parliamentary borough, lies on the Trent, 126 miles from London. It was formerly surrounded by high walls, which have now disappeared, and the 20 square miles of the city have of late been much improved by the widening of the streets and the erection of new buildings. It contains a city hall, St. Mary's church, guildhall, university college, a library and museum, besides an old hospital, and Roman Catholic cathedral. The most important manufactures are lace and hosiery, but baskets, bicycles, cigars, and needles are also manufactured. The principal events of its history are the occupation by the Danes until 868; destruction by fire in 1140 and 1153; its first charter in 1155, the convention of three parliaments and the raising of the standard of Charles I. in the parliamentary war in 1642. Population about 240,000.

No'va Sco'tia. The province of Nova Scotia (including Cape Breton island, at its northeast extremity) has an area of 20,600 square miles. It is connected with New Brunswick by an isthmus, about sixteen miles wide, being otherwise surrounded by the waters of the Atlantic, bay of Fundy, and Northumberland strait. Its capital, and the seat of the provincial government, is Halifax, with one of the finest harbors in the world. Owing to its insular position, the Nova Scotian climate is more limited than that of inland portions of the Dominion, making the colony very suitable for high cultivation. The fertility of the soil, especially in the Annapolis valley and round the Basin of Minas, is unsurpassed, arising in part from the rich marine deposits left on the coast lands by the tides of the bay of Fundy. Large areas of the salt marshes have of recent years been reclaimed by a system of mud dykes, and yield largely of a valuable salt hay, as well as rich crops from the productive meadow-land. Fruit is also profitably cultivated, especially the famous Nova Scotia apples. There are still also excellent hunting, shooting and fishing, in various sections of the province, while it has considerable mineral wealth, especially of coal.

Historically, Nova Scotia has an attractive interest for the student who knows Acadian annals, and finds zest in the long conflict between France and England for mastery in the New World. The flames of enmity between these two European nations continued intermittently to blaze and smolder for a century and a half, until the fall of Quebec and the final retirement of the French from the continent. The first direct collision between the two powers in Acadia was Argall's expedition from Virginia, which captured the fort and destroyed the French settlement at Port Royal. This occurred in 1618. Then came the expedition against the same beautiful land-locked basin and frowning fort, sent out by Cromwell, followed by Phip's expedition from New England, its reinvestment and recapture in the time of Queen Anne, when its name was changed to Annapolis; after which Louisburg, with its extensive fortifications, became the scene of conflict and the grim test of British and colonial prowess. On the fortress of Louisburg, the "Dunkirk of America," the French expended thirty thousand livres, only to see it fall with frightful carnage, first, before the assault of Colonel Peperall's colonial levies, aided by the British fleet; then, and finally, before Admiral Boscawen's armada, assisted by the invincible brigades of General Wolfe's command, who were soon to terminate, on the heights of Quebec, French dominion in North America. As an incident of this struggle of races in Acadia, we have that most pitiful historical pendant, the expulsion of the French Neutrals with their belongings from the beautiful Basin of Minas and the land celebrated in Longfellow's *Evangeline*. Stern was the necessity for this banishment of the Acadians from the

reclaimed land of Grand Pré; but tragic as is the story, it is well to remember that the narrative embodied in the poet's romance is not altogether to be taken for history. For the story of other dramatic incidents connected with the period of French occupation of Acadia — such as the long quarrels of the rival French governors, Charnissay and De la Tour, and the heroism of the latter's noble wife — the reader is referred to the Acadian annalist, and especially to the works of the historian, Francis Parkman.

Representative government was established in Nova Scotia in 1758, with Halifax as a capital of the colony. At this era, Nova Scotia also included Cape Breton and what is now known as New Brunswick. In the year 1784, however, both of these territories were organized as separate provinces, Fredericton becoming, four years later, the capital of New Brunswick, with Sidney as the chief town of Cape Breton. In 1820, the island of Cape Breton was re-annexed to Nova Scotia. Prince Edward Island (or what was then called The Island of St. John), on its cession in 1763 by France, became also a part of the province of Nova Scotia. In 1770, however, it was made and has since remained a separate province, with representation from 1873, when it entered confederation, in the Dominion parliament. Nova Scotia has to-day a population estimated at 459,116. Besides its representation in the senate and in the house of commons, in the Dominion parliament at Ottawa, it has a local parliament with one chamber, with an executive and a lieutenant-governor. The local assembly meets at Halifax. The educational institutions of the province include, in addition to the elementary schools, Dalhousie college and university (Halifax); university of King's college (Windsor); university of Acadia college (Wolfville); university of St. Francis-Xavier college (Antigonish); St. Ann college (Church Point); together with a Presbyterian college, and a ladies' college, at Halifax; a Church school for girls, at Windsor; Acadia seminary at Wolfville; and a provincial school of agriculture at Truro. The chief towns, besides Halifax, are Lunenburg, Liverpool, and Shelburne, to the northwest of the capital; Yarmouth, at the entrance to the bay of Fundy; Annapolis, at the eastern side of that bay; Pictou, on the northwest coast of the peninsula, and Windsor, in the interior. The only town of note on Cape Breton is Sidney, on the east coast, with important collieries in the vicinity. Louisburg is now a dismantled ruin, the great fortifications of the place having been demolished in 1758. See Hannay's *Nova Scotia*, and *Appleton's Canadian Guide-Book*, Part I.,— Eastern Canada,— by Charles G. D. Roberts.

No'va Zem'bla, an island in the Arctic, lying between the Kara and Barents seas, is about 600 miles long and 60 wide, almost cut into two narrow strips by the sea passage Matochkin Shar. Nothing is known of the interior, and it is only visited by Russians and Norwegians to capture sea fowls, seals, whales, walrus, and dolphins. The country was known to the Novgorod hunters in the 11th century, and rediscovered by Sir Hugh Willoughby in 1553, and has since that time afforded a place of much search and interest. Much has been learned of the country, which may be said to be uninhabited, since 1868.

Novem'ber, from the Latin, meaning "nine," was the ninth month of the Roman calendar year, when there were thirty days to the month of November and ten months to the year. Then it was given only twenty-nine days, but Cæsar gave it thirty-one, only to have it restored to thirty by Augustus. Its festivals are All Saints (1), St. Hubert (3), St. Martin (11), St. Catharine (25), and St. Andrew (30).

Nov'gorod ("new town"), a famous Russian city, capital of a government, is situated near lake Ilmen on the Volkhoff river. In 864, Rurik, a Norseman, was invited here to rule, and with him begins the history of the country. In the 12th century the city, which then had 400,000 inhabitants, was the market of northeastern Europe, and its almost republican government ruled from the White sea to the river Petchora. In 1471, on account of the jealousy of the Moscow princes, the czar Ivan III. destroyed Novgorod, deprived it of its liberties, and exiled its best citizens. Afterward the port of Archangel was opened and the city began to decline. The oldest building is the Church of St. Sophia, founded in the 11th century, besides thirty other churches and the wall surrounding the Kremlin. Population 26,095.

Nu'bia, the modern name of a large African region, formerly part of Ethiopia, and extending on both sides of the Nile from Egypt to Abyssinia and from the Red Sea on the east to the desert on the west. Of late, Nubia has been called the Egyptian Sudan. It was under the rule of the Pharaohs, but under the 20th dynasty was recovered by native rulers, who adopted Egyptian civilization and later became Christianized. The country is now occupied by mixed races, probably descendants from the pure negro stock mixed with the Hamatic and Semitic Arabs who invaded the land in the 7th century, and conquered it in the 14th. Until 1820, it was ruled by native Moslem chiefs, but in that year it was made a part of Egypt by Ismail Pasha, and so remained until 1881. The greater part of the country is arid desert, with small oases here and there on the route of caravans. The most fertile region is near Dongola. Its population, which consists chiefly of Egyptians, sedentary and nomad, number 240,382.

Nucellus (*nū-sĕl'lŭs*), (in plants), the main body of an ovule, usually more or less

invested by an integument or integuments. It is the nucellus which is really the megasporangium, and which contains the megaspore or embryo-sac. See OVULE.

Nucleus (*nū'klē-ŭs*), (in plants), a special protoplasmic body always found in cells. So far as known, every cell must contain nucleus and cytoplasm. In the process of ordinary cell division the initial steps are taken by the nucleus. Ordinarily, the nucleus is a spherical body and is usually centrally placed. It is difficult to see under ordinary circumstances without the use of special stains which color it. See CELL.

Nu'ma Pompil'ius, the second Roman king, (who ruled 715–672 B. C.), successor to Romulus, was a native of Cures, in the Sabine country, and esteemed for his piety and wisdom. He was elected king by the Roman people and by the aid of supposed interviews with the nymph Egeria in the groves near the city began to draw up forms of religious institutions for the people, and was thus, according to story, the author of the Roman ceremonial. He reigned during thirty-nine years of peace and happiness.

Numid'ia, the name given by the Romans to that part of Africa which is now Algiers, and reaching south to the Atlas mountains. The inhabitants were of the race from which the Berbers are descended; were warlike, faithless, dishonest, yet excellent horsemen. In the war between the Carthaginians, Massinissa, the chief of the powerful eastern tribe, joined the Romans and later ruled the entire country. Of his successors Jugurtha and Juba are best known. After Cæsar conquered Juba I., Numidia became a Roman province, but Augustus gave the western part to Juba II. Among the more important places were Hippo, Raguis, Zama, and Cirta, afterward called Constantina, and now Constantine.

Nur-ed-Din' Mahmud, emir and sultan of Syria, was born at Damascus in 1116. He is noted for his defeat of the first and second crusades of the Christians, the conquering of Tripolis, Antioch, and Damascus, and the taking of all the Christian strongholds in Syria in 1151. In 1168, he was made sultan of Syria and Egypt, and while preparing to invade Egypt, died at Damascus in May, 1173. He was the bitterest enemy of Christianity, but was a patron of science, art, and literature, and a good administrator of justice.

Nu'remberg, a city in Middle Franconia, a province of Bavaria, stands on the river Pegnitz, 95 miles from Munich. It is one of the most interesting cities of Germany, with its old walls, gates, bridges, and fountains. The castle, built by Conrad II. and Frederick Barbarossa, is famed for its paintings and wood carvings. The most notable buildings are St. Lawrence church (1274), St. Sebald's church (1225), the Italian Renaissance town hall (1622), the gymnasium (1526), the new law courts, the Germanic museum, and the library of 70,000 volumes. The city has no foreign commerce outside of that in toys, known as Nuremberg wares, but has a large home trade in metal and wood specialties, bone carvings, type, lead pencils, and chemicals. Nuremberg was first heard of in 1050, and became a free city in 1219. The Hohenzollerns sold their rights to it in 1417, and it immediately began to rise as the German home of arts and inventions and became a center of commerce. The discovery of the Cape passage to India, and the Thirty Years' war, proved the city's ruin, and although it retained its independence until 1803, it entered the Rhenish confederation, and in 1806 became one of the cities of Bavaria. Population 261,022.

Nuta'tion, regular bending of plant parts, such as bud scales, flower leaves, stems, etc., due to unequal growth on the sides. The stimulus inciting it may be light, heat, or gravity. (See IRRITABILITY.) Thus the flowers of the tulip and crocus are sensitive to temperature changes of a few degrees, opening with rising and closing with falling temperature, because the growth of the outer face is hastened and that of the inner face retarded, and vice versa. When a cylindrical stem has its growth hastened on every side in regular succession, the tip describes a more or less regular circle, as in twining plants like the hop and morning glory. Some nutations are apparently spontaneous.

Nut'hatch, a small creeping bird seen running up and down the trunks of trees. The feet have sharp claws which adapt them for holding to the bark, the tail is short and square, and is not used to assist the bird in climbing. They feed upon insect's eggs and larvæ, which they find on the trees, and also on nuts. With their rather slender bills, they excavate a hole for a nest in some decayed limb. The white-breasted nuthatch, bluish-gray above, whitish below, is common in the United States, and remains throughout the year as far north as New England. It is very nimble, and may be seen running rapidly in any direction on the bark of trees. It is also called sap-sucker. The red-breasted nuthatch is more northernly in its range, nesting from Maine northward and in the mountains further south.

Nut'meg. See SPICES.

Nutri'tion (in plants), the processes by which food is obtained and utilized. Plants obtain their food (which see) in two ways, by absorption and by manufacture. With a few exceptions, plants which obtain their food ready-made are unable to engulf it and must take it into the body in solution. (See ABSORPTION.) If insoluble in water, they must first digest it. (See DIGESTION.) All prepared food is derived directly or indirectly from other

organisms. A few plants capture small insects for the sake of the food derived from their bodies. Parasites, that is, creatures growing on or in a living being (called, therefore, the host), derive their food directly from it; saprophytes in a similar way obtain their food from a dead organism. There is every possible gradation between parasites and saprophytes; and between saprophytes and green plants, which are able to make all of their food out of inorganic material. Yet many green plants absorb organic matter, *i.e.*, matter once a part of a living being; this is the reason for applying fertilizers and manures to gardens and fields. Many, perhaps all, colorless plants can make the most complex foods (proteids), provided simpler foods and necessary salts are supplied. Only green plants, however, and of these only the green parts, can make carbohydrate foods, like sugars, starch, and the like, out of carbon dioxide, and water. (See PHOTOSYNTHESIS.) When these foods have been formed in sufficient amount, the green plants can also produce proteids. Most plants make more food than they require. Reserve food is stored, usually in solid form, in special tissues. These storage regions have been greatly improved by cultivation, the common vegetables (seeds, tubers, bulbs, roots, leaves, and even flower buds) being the product of proper breeding and of growing the plants under unusually favorable conditions for nutrition. In its broadest sense, nutrition includes the use of foods in assimilation, respiration, and growth. These topics are separately treated. In the course of the chemical processes of nutrition (see METABOLISM) a great variety of waste products arise, such as gums, resins, volatile oils, tannins, alkaloids, etc. These the plant secretes and removes them thus from its general metabolism. See SECRETION.

C. R. BARNES.

Nyas'sa or **Nyanja,** the most southern of the great East African lakes, is 260 miles from Tanganyika and 400 miles from the east coast. It is 1,570 feet above sea level, very deep, rapidly descending from its high and rocky shores, and measures about 350 miles long by 40 miles broad from east to west. It was known by the Portuguese as Maravi in the 17th century, but was first navigated by Livingstone, and its situation exactly determined in 1859.

Nyassal and (*n.i-ăs'să-lănd*), the name given to a British Central Africa protectorate, the country lying immediately south, west, and northwest of Lake Nyassa, in East Africa. It has no outside boundaries, but is the region in which the African Lakes company of Glasgow operates in connection with the missionaries of the Church of Scotland, with principal stations at Blantyre and Bandawe. The company and mission stations were founded on the recommendation of Dr. Livingstone to check the Arab slave trade. It is now under the administration of the British foreign office, by a resident commissioner. Its products are rice, coffee, rubber, and ivory. The capital is Blantyre. Some trouble has been caused of late by the claim of sovereignty made by Portugal; but the sphere of the Nyassa company, with a royal charter from the Portuguese crown, is the region between the Rovuma, Lake Nyassa, and the Lurio.

Nye, Edgar Wilson, an American writer and humorist who wrote largely under the pseudonym of "Bill Nye," was born at Shirley, Me., Aug. 25, 1850. He was but two years old when his parents moved to St. Croix county, Wis., where he received a common school education. He studied law there and later went to Wyoming where he was admitted to the bar and elected to the legislature. He also acted as postmaster and newspaper correspondent. On account of ill-health he returned to the east and settled in New York, where he was offered a large salary, as it seemed to him, on account of the notoriety his humorous contributions to the press had achieved. His first book, published in Chicago in 1881, was entitled *Bill Nye and the Boomerang*. In connection with James Whitcomb Riley, "the Hoosier poet," he made a tour of the country giving entertainments consisting of lectures and readings, which tour covered some years following. In 1891, he wrote a play called *The Cadi*, which appeared at the Union Square Theatre, New York. Although he issued a number of books, they were of an ephemeral character, and the humor which characterized them was largely dependent upon incidents now forgotten. He died at his home near Asheville, N. C., Feb. 22, 1896.

Nymphs, of Greek mythology, were the female divinities of the lower rank, inhabiting the seas, streams, groves, meadows, and pastures, caves, fountains, hills, and trees. Of their different classes were Oceanides, nymphs of the great sea; Nereids, of the inner sea; Potameides, of the rivers; Naiads, of fountains, brooks, lakes, and wells, and Dryads, of the trees and forests, who were supposed to die with the trees in which they lived. They were the goddesses of moisture, had power of prophecy, and guarded the nourishment and growth of infants. Many of the most beautiful Grecian sculptures are those of nymphs.

O

Oak, species of *Quercus*, a genus containing about 200 species, all natives of the northern hemisphere. About 50 species belong to North America, and among them occur some of the finest and best known of our forest trees. They are easily recognized by their characteristic leaves, and especially by their peculiar fruit, the well-known acorns. Among our most conspicuous species are the white oak (*Q. alba*), red oak (*Q. rubra*), scarlet oak (*Q. coccinea*), burr oak (*Q. macrocarpa*), chestnut oak (*Q. acuminata*), and live oak (*Q. Virginiana*). The last is a beautiful southern form with evergreen leaves.

OAK BRANCH IN FRUIT.

Oak Apples, called also nutgalls and gallnuts, are round balls about as large as an apple, found on the leaves and stems of oak trees, and are produced by the action of insects. The insect pierces the plant, and places an egg with a small quantity of poisonous fluid in the opening. The gall, or apple, grows rapidly and is fully formed before the egg hatches. The insect remains in the apple during its second stage, and finally as a gallfly eats its way into the world. The nuts are used in making ink and tannin.

Oak'land, a city of Alameda county, Cal., is situate on the east side of San Francisco bay, four and one-half miles from San Francisco. It is a beautiful city, well shaded and watered, with many fine residences — many of them the homes of the business men of San Francisco. The Congregational Theological seminary and a Catholic college are established here, and at Berkeley, four miles north, is the state university. The city manufactures cotton and woolen goods, jute, iron, nails, shoes, and pottery, and has large canning factories. Population 66,960.

Oasis (*ō'ā-sis*), a fertile spot in the desert, due to the presence of wells or underground springs. The French have made oases in the Algerian deserts by sinking artesian wells. Some of these spots in the African deserts are large enough to be inhabited, and grow crops of rice and millet, and are shaded with palms.

Oats, species of the genus *Avena*, belonging to the grass family. The common cultivated oat is *A. sativa*, which is native to the eastern hemisphere. The genus contains about 50 species, which are widespread in the north temperate regions. In the United States three species occur, the purple oat (*A. striata*), Smith's oat (*A. Smithii*), and the common wild oat (*A. fatua*). The cultivation of *A. sativa* and its varieties as a commercial industry is too well known to need description.

Oaxaca (*wä-hä'kä*), a state of Mexico, near the isthmus, is bounded on the north by Puebla and Vera Cruz, east by Vera Cruz and Chiapas, south by the Pacific ocean, and west by Guerrero. It contains an area of 35,382 square miles and the population is estimated at 872,902 persons, of whom the much larger part are civilized Indians. The greater portion of the area is mountainous, the Sierra Madre del Sur rising to a height of 1,200 feet, and running across the whole width of the state from east to west. The capital, of the same name, 210 miles southeast of Mexico city, has about 32,500 population. The resources are among the best in Mexico, its elevation giving it a considerable rainfall and a less oppressive climate than that found in several of the states of that country. Its soil is good, and wheat, coffee, sugar, cotton, cocoa, plantains, and fruits of all kinds are exported.

Obadi'ah, one of the twelve "minor prophets," of whom almost nothing is known. The book that bears the name was written probably about 587 B. C., and is in two divisions, one prophesying destruction to Edom, and the other foretelling the restoration of Israel. See *Minor Prophets*, by Farrar.

Ob'elisk, a memorial monument of stone with a pointed top. It has usually four faces, and is broadest at the base. The height varies from a few inches to 100 feet. These monuments were used by the Egyptians at the entrances of their temples, probably to record the honors and triumphs of their kings. They are covered with inscriptions, in Egyptian hieroglyphics, or picture writing. They are very ancient, going back to the 4th dynasty in Egypt, though the larger part date from the 18th and 19th dynasties. Two large ones, which stood at Heliopolis, were carried by Rameses II., one of the Egyptian kings, to Alexandria, and have been called Cleopatra's Needles. One of these was erected on the Thames embankment in London in 1878, and the other, presented by the khedive of Egypt to the United States, is in Central Park, New York. There are other of

these Egyptian obelisks at Rome, Florence, Berlin, and Paris. The Washington monument, finished in 1885 in the city of Washington, is an obelisk, and the largest in the world. It is 55 feet square at the base, and 555 feet in height. See *Egyptian Obelisks*, by Gorringe.

Ober-Ammergau (*o'ber-am'er-gow*), a village in Bavaria, 45 miles southwest of Munich. It is celebrated as the place where the famous miracle play, representing the Passion of our Saviour, is played once in ten years. It is the only survival of the old miracle plays, being excepted from the order abolishing them in Europe in 1779. In 1633, in gratitude for an escape from the plague which devastated the surrounding country, the people of the village vowed to perform this play once in ten years. The actors, in number 350, and the chorus of 80 members, are all taken from the villagers. It is played for twelve Sundays, in a large theatre holding 5,000 spectators, many of whom are visitors from all parts of Europe. See *Homes of Ober-Ammergau*, by Greatorex.

Oberlin College, located at Oberlin, O., thirty-four miles west of Cleveland, was established in 1833, and was chartered as "Oberlin Collegiate institute." In 1850, the name was changed to "Oberlin college." It is a coeducational institution and besides the college, theological seminary, and academy, provides courses for graduate students. The number of instructors, in all departments, including the conservatory of music, is 83, and the students in attendance in the college department 417.

Oberlin, a town in Lorain county, O., near Lake Erie, 34 miles west of Cleveland. It is a college town, with some factories and business blocks. It is the seat of Oberlin college, founded in 1833, and for some time was very unpopular because of its receiving colored students. It is now one of the large colleges of the country, with over 80 instructors and about 1,320 students of both sexes, with some very fine buildings. Population 4,082.

Oberlin', Johann Friedrich, a German minister noted for his benevolence, was born at Strasburg, Germany, Aug. 31, 1740. He became the Protestant pastor of Waldbach, a village in a wild mountainous district of Alsace. The country had suffered terribly in the Thirty Years' war, and the people were very poor and ignorant. Oberlin gave his life to elevating them, introducing better modes of farming, and some manufactures, making roads and bridges, founding libraries and schools, among them the first infant schools. The population increased from 500 to 3,000 during his life. Though laboring in a small sphere, his reputation for philanthropy has extended over the world. He died June 1, 1826. See *Life*, by Butler.

Obi (*o-bē*) or **Ob** is the great river of western Siberia. It rises in two branches in the Altai mountains in the Chinese dominions, and flows north, 2,120 miles, into the gulf of Obi in the Arctic ocean. It is very little used for navigation, but with the growth of the country will probably become one of the great water routes for commerce. Its chief tributary is the Irtish.

Observ'atory, an institution equipped for the study of astronomical or meteorological phenomena. In distinction from a laboratory, which is a place where phenomena can be brought to pass and where experiments can be tried, an observatory is a place intended for the observation of phenomena over which we have no control, such as an eclipse of the moon or a sudden variation in the earth's magnetism. Those institutions which are exclusively devoted to observational work are the purely astronomical observatories. Scarcely any other kind existed previous to the invention of the spectroscope by Kirchhoff and Bunsen. Recently, however, a number of astrophysical observatories have been established—notably at Potsdam in Germany, at Meudon in France, at Tulse Hill in London, at Cambridge, Washington, Allegheny, Columbus, Lake Geneva, and Mount Hamilton in America. In these institutions many experiments have to be tried as well as many observations made; for the spectra of various stars, planets, nebulæ, comets, etc., have to be interpreted as well as described. And their interpretation can be given only after experiment has shown how to duplicate them. Hence an astrophysical observatory is generally also a laboratory, provided with electrical, photographic, and spectroscopic apparatus. The same is more or less true of a magnetic observatory.

The typical astronomical observatory is equipped with a clock and an instrument for correcting this clock from the passage of stars over the meridian of the place. It is provided also with a telescope, housed in a dome which can easily be opened to the sky on one side and easily rotated. The more important observatories of the world are as follows: The Yerkes observatory at Lake Geneva, with a refracting telescope whose object glass is 40 inches in diameter; the Lick observatory at Mount Hamilton, Cal., with an objective of 36 inches diameter; the Harvard college observatory at Cambridge, Mass., with a branch in Arequipa, South America; this institution employs between 30 and 40 workers and is making a superb spectroscopic survey of the heavens; the Naval observatory at Washington and the McCormick at the University of Virginia each have 26 inch glasses, while the Halstead observatory at Princeton university follows with one of 23½ inches. The Greenwich observatory in England is a national institution, which has a brilliant history and is doing a great variety of work. The corresponding institution for France is the Paris

observatory, and like Greenwich in England and Pulkowa in Russia, has a history of which it may well be proud, but which is too long for discussion in this place.

Obsid'ian, a natural glass, a variety of lava. It is hard, brittle, with a glassy luster, partially transparent, and sharp edges that cut like glass. It is black, dark gray, green, red, brown, striped or spotted, a specimen usually having but one of these various colors. It is used for jewelry and ornamental articles, and in early times was employed for arrow-heads, knives, and mirrors. It is found in the Yellowstone park, and at other localities in the United States; in Iceland, the Lipari islands, Vesuvius, Sardinia, Hungary, Spain, Mexico, and South America.

Ocelot (*o'ce-lot*), a leopard-like cat inhabiting the wooded parts of America from Arkansas to Patagonia. It varies in length from two to three feet, and a full-grown animal reaches a weight of twenty-five pounds. Its fur is tawny or reddish-gray, marked with black spots and elongated blotches. The black color is sometimes in the form of a ring inclosing a spot somewhat darker than the general color of the fur. The ocelot is an agile climber; it feeds on birds and other small animals, and is very bloodthirsty.

OCELOT.

O'Con'nell, Daniel, the Irish "liberator," was born in County Kerry, Ireland, Aug. 6, 1775. He was brought up by an uncle, and studied in France at the College of Douai, from which he was driven to England by the breaking out of the revolution. He was admitted to the Irish bar in 1794 and became famous as counsel, the "counselor" being one of the titles by which he was known among his followers. His large practice, worth, he said, $35,000 a year, was sacrificed for his country, when he took a leading part in Irish politics. He was head of the Catholic party and contended for the admission of Catholics to parliament, which he secured in 1829. Noted for his fierce attacks on his opponents, he received several challenges to duels, but fought only one, in which he unfortunately killed his antagonist. He settled a pension on the widow, and vowed never to fight again. In 1823, the Catholic association formed by him became very powerful, with a large income. This was followed by a new political society, called "The Friends of Ireland of All Religious Persuasions," which, when suppressed, was followed by a succession of others under new names. He entered parliament in 1829, supporting the Whig party during the reform struggle, advocating free trade in corn, negro emancipation, the repeal of the laws against the Jews, and universal suffrage. He believed that Ireland would never have her rights until the act of union with Great Britain should be repealed; but in all his efforts to accomplish it, and to arouse the Irish nation, he was careful not to use force, or allow anything criminal. "He who commits a crime adds strength to the enemy," and "No political change whatever is worth the shedding of a single drop of human blood," were sayings of his. One of the greatest of orators, his remarkable speeches in parliament, one of which lasted for seven hours, were equaled only by his popular addresses throughout Ireland.

In 1840, he founded his famous Repeal association, the members of which paid from $50 to 25 cents annual fees, and which in 1843 had an income of over $200,000. The country then was thoroughly aroused, O'Connell traveling in one year over 5,000 miles, and addressing monster meetings that were held everywhere. The largest one, held on the Hill of Tara, Aug. 15, 1843, was attended by 750,000 people. A great meeting appointed for Sunday, Oct. 5, 1843, was prevented by the English government, which was now alarmed, and had sent 35,000 men into Ireland. In 1844, O'Connell, with his son and five others, was tried for sedition and sentenced to imprisonment for one year, and a fine of $10,000, and though the house of lords soon set aside the verdict, the fourteen weeks he was in prison brought on the ailment of which he died. The new party in Ireland, "Young Ireland," now separated from O'Connell because of his unwillingness to use force in obtaining the independence of his country, withdrawing from the association. The potato famine followed, and sick with the sight of the suffering of his country, sad with the consciousness of failure, and worn out with a struggle with disease, he left Ireland for Rome, longing to die there, but only reached Genoa, where he died May 15, 1847. His heart, at his own request, was carried to Rome, and his body buried at Dublin, at the base of a tower 165 feet high. "Grattan sat by the cradle of his country and followed her hearse; it was left for me to sound the resurrection trumpet, and to show that she was not dead but sleeping" is his own verdict on his work for Ireland. See *Leaders of Public*

Opinion in Ireland, by Lecky; *O'Connell* in the "Statesmen" series; *Life*, by his son John O'Connell.

O'Con'nor, Thomas Power, an Irish statesman, was born at Athlone, County Roscommon, Ireland, Oct. 5, 1848. He was educated at the college of the Immaculate Conception, Athlone, and at Queen's college, Galway, graduating with honors in 1866. He entered journalism in Dublin the next year, going three years later to London. In 1876, Mr. O'Connor published the first volume of his *Life of Benjamin Disraeli, Earl of Beaconsfield*, but later republished the same under the title *Lord Beaconsfield*, condensing all his material into one volume. It was not flattering to Lord Beaconsfield, and the work made him foes as well as friends. He served for some time as the London correspondent of the *New York Herald*. In 1880, he entered parliament as member for Galway, and was returned for both Galway and Liverpool in 1885. He chose to accept the latter, and has represented one division of that city ever since. In parliament he was one of the most active followers of Mr. Parnell, and out of it one of the executive committee of the Land League. In 1883, he was elected president of the Irish National league of Great Britain. He has edited a *Cabinet of Irish Literature*, and published *The Parnell Movement*. In 1891, he issued a *Life of Charles Parnell*. He traveled extensively in the United States in 1881, lecturing upon Irish politics. Mr. O'Connor is still a member of parliament, late editor of the *London Sun*, and now editor of *M. A. P.* (Mainly about People).

Ocon'to, a town in Wisconsin, on Green bay, at the mouth of the Oconto river. It has large sawmills and a large trade in pine lumber. Population 5,646.

Octa'via, the sister of the Emperor Augustus, was the wife of Mark Antony, whom she married in 40 B. C. to secure his reconciliation to her brother. Though she was noted for her beauty, her noble disposition, and womanly virtues, Antony forsook her in a few years for Cleopatra. In 32 B. C., war broke out between Antony and Augustus, and he sent Octavia a divorce. She showed her noble character by caring for the children of Cleopatra with her own after the death of Antony. She died in 11 B. C. See Shakespeare's *Antony and Cleopatra*.

Octa'vian. See AUGUSTUS.

Octo'ber, from the Latin "octo," meaning eight, was the eighth month of the year at Rome, but became the tenth when Numa changed the beginning of the year to the first of January. There were many attempts made by the Roman senate to change the name.

Oc'topus, also called devilfish, a mollusk related to the squid. It has no shell, either external or internal, and belongs to the class (*Cephalopoda*) called in general cuttlefish. It has eight arms provided with suckers, arranged around a central body. The squid (which see) has ten arms. The body of the octopus is rounded, with large staring eyes, and situated in the center of a membrane which serves to connect the bases of the arms. There are a number of species. They inhabit rocky coasts and feed on mollusks and crus-

OCTOPUS.

tacea. The common octopus of the West Indies and the Mediterranean sea is about nine feet long and weighs about sixty-eight pounds. It is eaten in Mediterranean ports, and the flesh is also used for bait. One species, found on the Pacific coast, is sixteen feet long and has a spread of about twenty-eight feet. The body is so small in comparison to the length of the limbs, that it measures only six inches in diameter and one foot in length. They are naturally timid and have not been known to attack human beings. The lurid description of the devilfish in Victor Hugo's *Toilers of the Sea* is a creation of the fancy.

O'der, one of the main rivers of Germany, rises in Moravia, crosses Silesia, Brandenburg, and Pomerania, finally emptying through three channels into the Baltic sea. It is 550 miles long, but owing to its rapid fall and the sediment left at the mouth of its many tributaries, its navigation is difficult, and great expense is necessary to prevent its overflowing.

Odes'sa, the fourth city in Russia, a seaport of the Black sea, about half way between the Dnieper and Dniester rivers. It is built facing the sea, on cliffs, with deep ravines, and with galleries hollowed out of the soft rock, in which many of the poorest people live. It is a modern city, founded in 1794, near an old Turkish fort, but has grown rapidly, being the chief shipping port for the corn-growing districts of southern Russia. The harbor is protected by moles against the dangerous winds of the Black sea, and is menaced by ice hardly more than a fortnight in the whole year. The trade is largely in

grain, principally wheat, but sugar, wool, and flour are also exported. It also has sugar and oil refineries, and tobacco, leather, soap, and chemicals are manufactured. It has a university with 709 students, a public library, historical museum, cathedral, opera house, and great grain warehouses and elevators. Water is brought to the city from the Dniester river by an aqueduct 27 miles long. Odessa is known as a home of the cholera, and for its persecution of the Jews, and as the headquarters of the nihilists. Population (1897) 405,041.

O'din, the chief god of Scandinavian mythology. He is not the creator of the world, but its ruler, and the ruler of heaven. His home is in Asgard, whence he sends forth daily his two black ravens, Hugin and Munin (Thought and Memory), to bring him news of all that is happening in the world. As god of war he holds his court in Valhalla, where all brave warriors gather after death. He became the wisest of gods by drinking from Mimer's fountain, but at the price of an eye. Frigga is his queen, though he had other wives. His Saxon name, Woden, is perpetuated in our Wednesday, or Woden's day.

Œdipus (*ēd'i-pus*), a hero in Greek legend, whose story is the subject of some of the finest tragedies of Sophocles and Euripides. He was the son of Laius, king of Thebes, who, having learned from an oracle that his own son would kill him, exposed him at his birth with his feet pierced through on Mt. Cithæron. He was discovered by a herdsman of the king of Corinth, named Œdipus from his swollen feet, and brought up by him as his own son. Learning from an oracle that he was to kill his father and marry his mother, he went to Thebes to escape his fate. Drawing near the city, he met the chariot of the king, and was ordered out of the way, which brought on a quarrel in which he slew his father, the king, not knowing him. The Thebans offered the kingdom and the hand of the queen to whoever would deliver them from the Sphinx, who proposed to all who passed her a riddle, putting to death those who could not solve it. Œdipus offered himself, and she asked him, "What being has four feet, two feet, and three feet, and only one voice; but whose feet vary, and when it has the most, is weakest?" Œdipus answered "Man," at which the Sphinx threw herself headlong from the rock where she sat. Œdipus thus became king and the husband of his mother. When a plague devastated the country, the oracle promised relief when the murderer of Laius should be banished, and Œdipus learned from a seer that he had fulfilled the prophecy of the oracle and killed his father, and had for a wife his mother. In horror he put out his eyes, while his mother, Jocasta, hanged herself. He wandered away with his daughter, Antigone, and near Athens was taken from earth by the Eumenides.

Oer'sted, Hans Christian, a distinguished Danish physicist, who first discovered a connection between electricity and magnetism, was born Aug. 14, 1777, and died at Copenhagen, March 9, 1851. He was educated in Copenhagen, where he took his doctor's degree in 1800, and where in 1806 he was appointed to a professorship in physics.

On July 21, 1820, he was passing the current of a large battery through a platinum wire, when he discovered that a magnetic needle near by was deflected. As shown by its consequences, this proved to be an epoch-making discovery, for which the Royal society awarded him the Copley medal and the Paris institute a mathematical prize amounting to 3,000 francs. See AMPÈRE.

Offenbach (*of'fen-bäk'*), **Jacques,** a Franco-Jewish composer, was born at Cologne, Germany, June 21, 1819. He settled at Paris, and became manager in one of the theatres. He composed a great number of operettas, but is best known for a series of burlesque operas, which make him the father of the modern comic opera. The *Grand Duchess*, *The Beautiful Helen*, *Genevieve of Brabant*, *Barbe-bleue*, and *Madame Favart* are among the most notable, the last being very popular in England. He died at Paris, Oct. 5, 1880.

Og'den, a city in Utah, at the union of the Weber and Ogden rivers, where the Weber passes through the Wahsatch mountains. It is situated 37 miles north of Salt Lake City, and is 4,340 feet above the sea. It is a railroad center, and has a Methodist university, a foundry, and several large mills, breweries, and factories. Population 16,313.

Og'densburg, N. Y., a city and port of entry in St. Lawrence county, on the St. Lawrence river, and connected by steam ferry across the St. Lawrence with the Canadian town of Prescott, Ontario. The city lies 175 miles northwest of Albany, and has communication by river westward to the Upper Lakes, and eastward by way of Montreal and Quebec to the Atlantic. By rail, it is served by the Central Vermont, and by the Rome, Waterdown, and Ogdensburg railroads. It has a large grain and lumber trade. Population 12,633.

Oglesby (*ō'g'lz-bi*), **Richard James,** an American soldier and statesman, was born in Oldham county, Ky., July 25, 1824. Being left an orphan at the age of eight years, he found a home at Decatur, Ill., as an apprentice to a carpenter. Working at his trade and studying law until he was twenty years of age, he was licensed in 1845, and began practice at Sullivan. He served as a first-lieutenant in the Mexican war, and at its close, with honor to himself, he returned to the practice of his profession at Decatur. On the discovery of gold in California, he set out for the mines where he remained two years. But

the outbreak of the Civil war found him again at Decatur ready for some new enterprise. He resigned his seat in the state senate, to which he had been elected in 1860, and plunged into the contest, leaving for the front at the head of the Eighth Illinois regiment. He participated in the battles of Ft. Henry and Donnelson, commanding a brigade in each. He was severely wounded at Corinth, but in April, 1863, he returned to duty as a major-general in command of the sixteenth corps. He was elected governor of Illinois and served in that capacity from 1865 to 1869. He was re-elected in 1872, but was chosen United States senator, Jan. 1873. He was governor of the state again from 1885 to 1889, and died at Elkhart, Ill., April 24, 1899.

O'glethorpe, James Edward, an English general and founder of Georgia, was born at London, Dec. 21, 1698. He served in the army, and was thirty years in parliament. He planned a colony in America, as a refuge for debtors, who were then imprisoned in English jails, and also for persecuted German Protestants. George II. gave the land, which was named Georgia after him, and parliament contributed $50,000, and in 1733 he took out 130 persons, and founded the city of Savannah. Another party, including the two Wesleys, went out in 1735, and in 1738 Oglethorpe returned to Georgia with a regiment of 600 men, in anticipation of a war with Spain. He invaded Florida, was unsuccessful in an attack on St. Augustine, but repulsed a Spanish invasion of Georgia. He left the colony in 1743, and surrendered the charter to the British government in 1752. He died in England, Jan. 30, 1785. See *Life*, by Bruce.

O'gowe or **Ogoway,** a river in the western part of Africa, that flows into the Atlantic ocean near Cape Lopez. In the rainy season it is a deep, broad stream, though numerous islands and sand banks prevent large vessels from ascending it. In the dry season it shrinks to a narrow current. The river was discovered by Du Chaillu in 1856.

Ohi'o, a river of the United States, one of the largest branches of the Mississippi. It was named by the French explorers "la Belle Rivière" (the beautiful river). It is formed by the union of the Allegheny and Monongahela rivers at Pittsburg, and flows southwest 975 miles, joining the Mississippi at Cairo, Illinois. It is from 400 to 3,000 feet wide, spreading out so as to become quite shallow in dry seasons. It is subject to floods from the accumulation of snows in the mountains near its headwaters; there is a series of terraces along the banks, which have evidently been the bed of the river. The boundary between the states of Ohio, Indiana, and Illinois, and West Virginia and Kentucky is formed by the Ohio river. At Louisville there are falls, which are passed by means of a ship canal. The river is navigable for its entire length, and carries on its waters enormous fleets of boats, laden with coal, besides other products of the regions.

Ohi'o, one of the north central states of the Union, is the fourth in population. It is nearly square, being 220 miles across from east to west, and 210 miles from north to south; area, 41,060 square miles. Lying between Lake Erie and the Ohio river, with a number of navigable streams, it is well watered and very fertile. It is hilly in parts, but never mountainous, the highest regions reaching an elevation of about 1,500 feet. There are harbors on Lake Erie, the largest at Sandusky bay, which is 18 miles wide, with a group of ten islands covering 2,800 acres, especially devoted to grape-raising. The national government has made improvements in the harbors of Lake Erie, and maintains twenty-nine lighthouses on its coast. The lake fish are a source of wealth to the state, Sandusky being one of the largest fresh-water fish markets in the country. There are two large canals connecting Lake Erie and the Ohio river. The climate of Ohio is very variable, with a large rainfall. In the northern part it is tempered by Lake Erie, so that the region is rich in orchards and vineyards. Ohio has large coal-fields, making it the third coal-producing state; while beds of iron-ore furnish material for its numerous furnaces and rolling-mills. It has large quarries of fine stone for building, and grindstones, and beds of gypsum and rock salt, and numerous salt wells. The petroleum wells are numerous and yield largely, making it second only to Pennsylvania in its oil-products, and natural gas wells supply fuel to many cities and large manufactories. Ohio is the richest state in ancient remains, implements of stone, bone, copper and clay, numerous mounds and extensive earth-works being found there. It is chiefly an agricultural state, raising large crops of corn, wheat, oats, potatoes, and hay, besides producing large quantities of maple sugar, honey, and flaxseed. Its orchards and vineyards are extensive, and it has a large trade in small fruits, and is also one of the first states in its pork products. It is becoming one of the leading manufacturing states, especially in the making of farm implements and all kinds of machinery, carriages, and furniture. It has great foundries and rolling-mills, paper mills, barrel factories, drain and tile factories, match factories, oil refineries, etc.

Ohio is noted for its large number of colleges, there being 34 universities and colleges in the state, besides professional schools, reporting nearly 700 professors and instructors and close upon 9,000 students of both sexes in all departments. As a result of its extensive public school system and these abundant means of higher education its proportion of inhabitants who cannot read is but 4.8 per cent of the population. In 1899, Ohio had 13,077 school buildings, 25,712 teachers, and

an average daily attendance of 613,337 pupils. The State university, with an agricultural experiment station, meteorological and forestry bureau founded in 1862, is at Columbus, the capital; Ohio university, at Athens, was founded in 1804, and given a grant of land when the state was settled in 1787; Oberlin, Kenyon, Miami, Marietta, Antioch, Delaware, Buchtel, and Wooster colleges, Denison university at Granville, Western Reserve university at Cleveland, with the Cleveland college for women connected; Cincinnati university with the Cincinnati observatory as a department, are among the leading institutions; while there are also schools of law, medicine, theology, and science, such as the Case school of science at Cleveland, Lane Theological seminary at Cincinnati, and the medical colleges of Cincinnati, Toledo, and Cleveland.

Ohio was occupied in 1680 by French fur traders, and in 1749 formally taken possession of in the name of Louis XV., leaden plates with records of the act being buried along the Allegheny and Ohio rivers. In 1763, it became a part of the English dominions, and by royal proclamation was set aside for the use of the Indians. Virginia claimed all of Ohio, according to the terms of her charter given by King James, and Connecticut claimed the northern part by her charter from Charles II. New York also claimed it by right of conquest by her Iroquois tribes. These different claims were all yielded at length to the United States government and Ohio became a part of the Northwestern territory. It was first settled permanently in 1788 by what is known as the Ohio company, formed of officers and soldiers of the Revolutionary war, who bought of the nation 1,500,000 acres between the Muskingum and Hocking rivers; and made their first home at Marietta. The second settlement in the same year was made at Cincinnati. For many years emigration to the new territory was checked by Indian wars, until after the battle of Maumee under General Wayne, when the Indians signed the treaty giving up their rights to nearly all of the state, besides parts of Indiana and Michigan. It was organized as a state of the Union in November, 1802. The state has railway lines with a total mileage of 8,920 miles. In 1796, the last buffalo was killed in the Hocking valley, and in 1810 the first steamer crossed Lake Erie, and in 1811 the *Orleans* was the first of the great fleet of steamboats that now run on the Ohio. In the War of 1812, Ohio was invaded by the British, but were repulsed at Fort Meigs, on the Maumee; and in the Civil war it was threatened at Cincinnati by a Confederate army under Gen. Kirby Smith, and "Morgan's Raiders" dashed through fifteen counties on its southern boundary. Population 4,157,545.

Ohio State University, located at Columbus, was organized as "Ohio Agricultural and Mechanical college," and was opened in 1873. By act of legislation, in 1878, the name was changed to "The Ohio State university." The university is maintained by an annual grant from the United States, and permanent annual grants from the state. It comprises colleges of agriculture, of arts, philosophy and science, of engineering, of law, and of veterinary medicine. The university is open to students of both sexes. The instructors number over 100, and the whole number of students is 1,252.

Ohm (*ōm*), **Georg Simon,** a German mathematician and physicist, was born at Erlangen, March 16, 1787, and died at Munich, July 7, 1854. He was educated at the university of his native town where he took his doctor's degree in 1811. In this same institution, he began teaching as a *privat-docent;* but was soon compelled to give this up for a salaried position at Bamberg and subsequently (1817) at Cologne. Ten years later, in 1827, he published his great work on the galvanic circuit, in which he proved the very simple relation existing between current, resistance, and electromotive force, a relation which is now known as "Ohm's Law." For this discovery, Ohm was awarded the Copley medal by the Royal society in 1841. In 1846-49, Kirchhoff extended this law and established two theorems, now known as Kirchhoff's Laws, which include Ohm's Law as a special case. In acoustics, Ohm discovered that the ear of itself analyzes any complex sound into simple tones in the manner contemplated in Fourier's theorem, a fact which proved to be of great importance later in the hands of Helmholtz. In 1852, Ohm was appointed to the chair of physics at the University of Munich. His most important work is, by all odds, his theorem concerning the galvanic circuit.

Oil City, a town in Pennsylvania, lying on both sides of the Allegheny river. It lies 133 miles northeast of Pittsburg, and is in the oil region, and one of the largest oil markets of the state. It has oil refineries, engine and boiler factories, and large manufactories of barrels. Population 13,264.

Oil Wells. See PETRO'LEUM.

Oils, a term used to indicate a large class of compounds. The more common animal and vegetable oils, which are the fatty or fixed oils, are all compounds of glycerine with fatty acids. The term fats is usually given to the solid forms, and oils to the fluid. The solid fats, however, become fluid when heated. All these fats and oils are lighter than water and will not mix with it. They penetrate paper or cloth, making it partly transparent, and leaving what is known as a grease spot. When pure and fresh they usually have little or no taste or smell, but when exposed to the air, become darker in color, have a disagree-

able taste and smell, and are called rancid. As examples of vegetable oils we have cotton-seed oil, linseed oil, olive oil, almond oil, and cocoa butter. Linseed is brought largely from Russia and India; Africa supplies palm oil; India and the Pacific islands cocoanut oil; while the best olive oil is brought from Italy. In animal oils the principal ones are butter, lard, tallow, neatsfoot oil, and sperm oil. Tallow is the fat of oxen and sheep, melted and purified. Lard, obtained from the hog, is one of the great products of the United States, 60,000 tons yearly being sent to Great Britain alone. Neatsfoot oil is produced by boiling the feet of cattle. Sperm oil and other fish oils are obtained from different varieties of fish and sea animals, as the whale, seal, cod, shark, herring, etc. The uses of the different oils are very numerous: as food, and in the preparation of food, in soap making, painting, machinery, and in a thousand other ways they are of great importance. There is a large class of substances known as the essential or volatile oils which resemble the fats somewhat in their properties, particularly in not mixing with water. They make a grease spot on paper which is not permanent. These are quite varied in composition, are more or less volatile and have strong and characteristic odors. Oil of turpentine, of lemon, of wintergreen, are examples of a great number of these products which are largely used as solvents, for flavoring, in perfumery, and in medicine. For mineral oils, see PETROLEUM.

Ojib'ways or **Chip'pewas,** a large tribe of North American Indians belonging to the Algonquin family, and living around the shores of Lake Huron and Lake Superior. They were usually at war with the Sioux and Iroquois, driving the Sioux from the sources of the Mississippi. They sided with the French, taking part in Pontiac's war; and in the Revolutionary war fought with the British. They came as far east as Lake Erie, but gave up all their lands in Ohio in 1817. In 1822, they numbered about 14,000. Their lands have gradually been ceded to the United States, and most of the tribe are on lands west of the Mississippi. Their history has been written by two members of their tribe. See *History of the Ojibway Indians*, by Peter Jones.

Oka', a river in Central Russia, the principal branch of the Volga. It flows northeast through the most fertile region of Russia, for 906 miles, to the Volga. It is navigable for part of the year only.

Okhotsk (*ō-kŏtsk'*), **Sea of,** an arm of the Pacific ocean, on the east coast of Siberia. It is 1,000 miles long, and 600 broad, and contains several islands. It is seldom navigated.

Oklaho'ma, a southwestern territory of the United States. It was a part of the Indian territory. This territory was given to five tribes of Indians from Georgia, Florida, Alabama, and Mississippi. There was more land than they occupied, and in 1866 the United States bought the western part of the territory for the use of the freedmen and Indians. The Oklahoma district, as it was called, covering about 2,000,000 acres, was a part of this purchase. The whites claimed it as public land, but were kept away by United States troops, the Indians claiming that it had been ceded only for the use of Indians and freedmen. In 1889, the government settled these contending claims by paying the Indians another sum of money, and the lands were declared open to settlers, April 22, 1889, and organized as a territory May 2, 1890. No one was allowed to enter the territory until noon, but by night there were 50,000 inhabitants, and the city of Guthrie (now the capital of the state) was built in a day, with 10,000 citizens. Other lands were bought in 1891, making the whole country cover about 28,600 square miles. The name means "beautiful country." It area is 39,030 square miles, divided at first into two parts by a strip of land belonging to the Cherokees, but which was afterward bought by the government. In the south are the Wichita mountains; and the Red river and Arkansas river with their branches furnish water routes. The great plain in the west is a rolling, dry country, covered with sage brush and cactus, but the river valleys are fertile, and much of the country is adapted to growing corn, cotton, and tobacco. A large part of the territory is still occupied by Indians. Population 398,331.

Oklaho'ma City, Okla., a recently settled but growing city, in Oklahoma county, on the North Canadian river; served by the Atchison, Topeka and Santa Fe and the Choctaw, Oklahoma, and the Gulf railroads, 28 miles south of Guthrie. Water-power is here derived from the rapids of the river for the city's industries, which include a cold-storage plant, packing-houses, flour mills, cottongins, brick-yards, grain elevators, etc. It has a considerable trade in lumber and agricultural products. Though founded only in 1889, the city, which has an active rival in Guthrie, has already a population of 10,037.

O'laf, Saint, one of the early Norwegian kings (1015–28 A. D.), was born in 996. He distinguished himself by his warlike expeditions on the coast of Normandy and England. In 1015, he wrested the throne of Norway from Eric and Svend Jarl. His efforts to exterminate paganism by fire and sword lost him the favor of his subjects, who offered their allegiance to Canute, king of Denmark, when he landed in Norway in 1028. Olaf fled to Russia, where he was given a band of 4,000 men, and returning, attacked Canute, but was defeated and slain (1030 A. D.) His body was thought to possess miraculous powers, for which reason he was proclaimed the patron saint of Norway.

Old'castle, Sir John, was born in England in the reign of Edward III. His fame rests upon the fact that he was the first author and the first martyr among the English nobility. He was known as the "good Lord Cobham," a title he acquired by marriage. He became one of Wyclif's followers, and at his own expense had Wyclif's writings copied and scattered among the people, and paid a large body of men to preach the doctrines of the reformer. He took part in presenting a remonstrance to the house of commons against the corruptions of the church. In 1411, he commanded an English army, which forced the Duke of Orleans to raise the siege of Paris. In 1413, he was condemned as a heretic, but escaped and hid four years in Wales. He was captured and brought to London, where he was hanged alive upon the gallows and then burned, in December, 1417. He wrote *Twelve Conclusions addressed to the Parliament of England.* See *Life*, by Maurice.

Old'ham, a manufacturing city in Lancashire, England, 38 miles from Liverpool. It was a small village in 1760, its growth being due to its nearness to the Lancashire coalfields, and its cotton manufactures. It has over 300 mills, and uses one-fifth of all the cotton imported. It also makes hats, velvets, and cords, and has large weaving machine works, one of which employs 7,000 hands. There are public buildings, including a town hall, lyceum, school of science and arts, and public baths; and a fine park. Population about 150,000.

Old Point Com'fort, a village at the mouth of the James river in Virginia. It is the site of Fortress Monroe, and is a famous pleasure resort. Its large hotel, accommodating 1,000 guests, faces Hampton Roads. It was destroyed in 1862, as it was in the way of the batteries on Fortress Monroe, but has been rebuilt and is very popular. The watering place is 13 miles north of Norfolk, Va.

Olean'der, species of Nerium, a genus belonging to the dogbane family. There are but few species, which are natives from the Mediterranean region through southern Asia to Japan. The common oleander of cultivation is *N. oleander*, native to the Mediterranean region; while *N. odorum*, a sweet-scented form, comes from the East Indies. The plant is said to be more or less poisonous, especially the leaves.

O'le Bull. See BULL.

Oleomar'garine, a substance made from tallow, resembling butter. It is also called butterine. The making of artificial butter was first suggested by a French chemist, and is now quite an important industry. The American factories produce large quantities, which is used in this country mostly for cooking purposes, but, shipped to Europe, takes the place of butter with the poorer classes. The beef suet is washed several times in lukewarm water, then minced fine in a cutting machine, and melted by steam, when salt is added. The fat floats on top and is drawn off, purified, and after it is cold, pressed to separate the butter-oil from the stearine. This butter-oil is the true oleomargarine. It is light yellow, and has a pleasant taste. A mixture made of two-thirds of this oil, about one-fifth milk, with a small amount of butter, and some coloring matter, is churned together, the product resembling butter in taste and appearance, and having all the elements that are found in butter made from cream. To prevent its sale as cream-butter, congress has passed a law taxing the sale and requiring every package to be marked as oleomargarine or butterine. The value of the annual product in the United States amounts to nearly $10,000,000.

Ol'ga, St., a Russian princess, and saint of the Greek church. She governed the country during the minority of her son. Going to Constantinople, she was baptized, taking the name of Helena, and labored with great zeal to spread her new faith throughout Russia. She died in 969, and is highly venerated by the Russian church. Her festival occurs July 21.

Ol'iphant, Laurence, an English traveler, author, and religious enthusiast, was born at Cape Town in 1829, but went as a child to Ceylon, where his father had an important government position. He visited Nepaul, an unknown country at that date (1850), and passed through southern Russia and the country of the Crimea, publishing an account of those regions at the outbreak of the Crimean war. Later he became private secretary to Lord Elgin, governor-general of Canada, and subsequently he served as superintendent of Indian affairs in that country. He took a trip throughout the most northern part of our territories, and published a book upon Minnesota in 1855. The earl of Elgin having been sent to China and Japan, Mr. Oliphant accompanied him; and while acting as charge d'affaires in Japan he was badly wounded by a Japanese fanatic, and was obliged to resign his post in the diplomatic service. For some years following (1861) he sat in the English parliament, and contributed to various periodicals, issuing a number of clever and amusing works. But having embraced spiritualism, under the influence of Mr. T. L. Harris, at that time a leader of the cult, he gradually fell into moody and abstracted habits, at last making his home in Haifa, Palestine, from which point he issued a large number of books, now little known. His earliest works were on travel, as *A Journey to Khatmandu*, in 1852. In the seventies he wrote sketches, such as *Piccadilly*, a novel, *Altiora Peto*, a *Narrative of Lord Elgin's Mission to China and Japan*, and in his last years religious works like *Sympneumatæa*, and *Scientific Religion.*

He died at Twickenham, England, Dec. 23, 1888.

Ol'iphant, Mrs. Margaret (Wilson), a Scottish novelist and writer, was born in Midlothian, Scotland, in 1828. Her first book, *Passages in the Life of Mrs. Margaret Maitland*, appeared in 1849, and at once attracted attention. Other works followed, some of them appearing in *Blackwood's Magazine*. Her reputation as a novelist was, however, first made by the publication of *The Chronicles of Carlingford*, running as a serial in *Blackwood's*, from 1861 to 1864, containing some of her best work. She has been a most prolific writer, having written over thirty novels, and ten or twelve other works. Among her contributions to general literature are, *The Makers of Florence; The Makers of Venice; Life of Laurence Oliphant; Life of Edward Irving*, and *Literary History of England from 1790 to 1825*. She edited the series of *Foreign Classics for English Readers*, writing two of them, *Dante* and *Cervantes*, herself. Her home was at Windsor, where she lived many years, having received a pension of $500 from the government in 1868. She died at London, June 25, 1897.

Ol'ive, species of olea, a genus containing over 30 species and natives of the tropical and subtropical regions of the eastern hemisphere. The common commercial species are under cultivation for the well-known fruit. The olive has been cultivated from the earliest times, chiefly for the sake of the oil, which is obtained from the fruit by pressure.

Ol'ives, Mount of, called also "Mount Olivet," lies east of Jerusalem, separated from it by the narrow valley of Jehosaphat. Its name came from a beautiful grove of olive trees, which formerly grew on its western slope, but has now almost disappeared. The brook Kedron flows through the valley, and by the bridge crossing it is the Garden of Gethsemane. The mount is divided into three summits, the highest 361 feet above Jerusalem, and 2,725 above the sea, and on the central summit is the village of Olivet. The northern peak is supposed to be the place where the angels appeared to the disciples after the resurrection of Christ, and was the site of the Roman encampment at the destruction of Jerusalem. The central peak is pointed out as the mount from which Christ descended, after his resurrection, the place where he wept over Jerusalem, and where he taught his disciples the Lord's Prayer. St. Helena built a church here, the site of which is now occupied by a later one, called the Church of the Ascension, and near it is a Mohammedan mosque.

Olm'sted, Fredrick Law, an American landscape-gardener, was born at Hartford, Conn., April 26, 1822. He studied engineering at Yale, and followed farming and gardening for a few years. Becoming interested in landscape-gardening, he traveled on foot through England in 1850, and in 1855 through France, Italy, and Germany, to study the parks and ornamental grounds of those countries. He published *Walks and Talks of a Farmer in England*, *A Journey in the Slave States*, *A Journey Through Texas*, and *A Journey in the Back Country*, after a tour through the south and west. He is best known as the superintendent, with Mr. Vaux, of the laying out of Central Park, New York, and also of the grounds around the capitol at Washington. He has also designed parks and public works at Chicago, Buffalo, Brooklyn, Boston, Milwaukee, and Montreal, and acted as commissioner of the national park of the Yosemite. He also planned the laying out of Jackson Park, Chicago, for the Columbian exposition. He was appointed by Lincoln on the commission to inquire into the sanitary condition of the United States army, serving on it three years (1861–63).

Ol'ney, Richard, an American jurist and statesman, was born at Oxford, Mass., Sept. 15, 1835. He graduated from Brown university in 1856, and afterward spent three years in the Harvard College Law school. Being admitted to the bar he began the practice of law at Boston and rapidly rose to fame. He took no active part in politics until, during the administration of President Cleveland, he was called to a place in his cabinet as attorney-general, and afterward as secretary of state. On the return of the Republicans to power he resumed the practice of law at Boston, having won distinction in the settlement of various important matters of state upon which he was called to act during his career in the cabinet.

RICHARD OLNEY.

Olym'pia, the capital of Washington, is built on a peninsula at the southern end of Puget sound, 65 miles from the Pacific ocean. The Des Chutes river, which enters Puget sound here, has a fall of 85 feet in 300 yards, which gives abundant water-power. There is a bridge, 2,030 feet long, across the end of the sound. The Coast mountains on the left and the Cascade mountains on the right, with the sound in front, make the scenery very fine. There are flour mills, sawmills, shoe and soap factories, and some good public buildings. Population 4,082.

Olym'pic Games, the most famous and splendid national festival of the Greeks, celebrated once in five years in honor of their

god Zeus, on the plain of Olympia. Olympia was a beautiful valley near the river Alpheus, and contained temples, monuments, altars, and statues, connected with Greek art and religion. There were about 3,000 statues here at the time of the elder Pliny (23–70 A. D.). The sacred grove was a level space, nearly square, being 600 feet long and about 580 feet broad. It looked toward the Ionian sea, with the rivers Alpheus and Cladeus on its southern and western boundaries. It was well-wooded and crossed by a road called the Pompic Way, the route taken by all the processions. The games date back of the year 776 B. C., but in that year became a national festival, and the custom of reckoning time by Olympiads began. The contests were at first permitted only among the Greeks, but after the Romans conquered Greece they took part in the games, Tiberius and Nero appearing in the list of victors. Women were not allowed to be present, with the exception of the priestess Demeter. The games were held at the time of the first full moon of the summer solstice, about the last of June. While the games were in progress, all hostilities were stopped by proclamation of heralds through the country. The contestants went through a ten months' training in the gymnasium at Elis, and the judges, at first two, but later twelve in number, were instructed as long in their duties. The judges held office only one year. The contests were foot-races, wrestling, boxing, leaping, running, throwing the spear and the discus, or quoits, with chariot and horse races. The fifth day there were processions, sacrifices, and banquets to the victors. The victors, each holding a palm branch, were presented to the people, and while heralds proclaimed their names and their parents', they were crowned with garlands of wild olive twigs, cut from a sacred tree of the grove. Statues were erected to them; they had the place of honor on public occasions, were usually exempt from paying taxes, and at Athens were boarded at the expense of the state. Songs were sung in their praise, as fourteen of Pindar's lyrics bear witness. The games were abolished by the Emperor Theodosius in 394 A. D.

Olym'pus, Mount, a group of mountains in Turkey between Thessaly and Macedonia. The eastern side fronts the sea, and has deep precipices and ravines filled with forest trees. The highest peak is 9,790 feet high. In Greek mythology it was the residence of Zeus, whose palace was thought to stand on its summit.

O'maha, the largest city of Nebraska, capital of Douglas county, is on the Missouri river, which is crossed by a railroad bridge 2,750 feet long. The city is built on a plain 80 feet above the river, which rises gradually into bluffs. The business portion of the city is on the level portion, while the bluffs are occupied by the tasteful homes of the citizens. The city hall, United States courthouse, chamber of commerce, state asylum for the deaf, Creighton college, a medical college, and over 100 churches are among its prominent buildings. The *Omaha Daily Bee* is the most important newspaper published between San Francisco and Chicago. Omaha ranks with Chicago and Kansas City as a live-stock market, having immense stockyards, which cover over 200 acres of land, and also large beef and pork-packing establishments, being the third city in the United States in the value of its pork products. The manufactures include linseed oil, boilers, safes, bags, soap, and beer. The largest silver smelting works in the world, using one-fourth of the silver ore mined in the United States, are located at Omaha. The military department of the Platte, covering 82½ acres, with fine barracks, is near the city. The public schools of Omaha are maintained at an annual cost of $450,000; the teaching force numbers 412, and there are 20,617 pupils in attendance. Omaha was founded in 1854, and rapidly became one of the leading western cities. Population 102,555.

O'mahas, a tribe of American Indians, of the Dakotah family, settled in northern Nebraska. They were found by Marquette (1673), by Carver (1766), and by Lewis and Clarke (1805). They were constantly at war with the Sioux, but since 1855 have been at peace and have improved rapidly. They cultivate the ground, and have churches and schools.

O'mar I., Abu Hafsah Ibn ul Khattab, the second caliph of the Mussulmans, was born about 581 A. D. Although he was at first bitterly opposed to Mohammed, he suddenly gave his adherence to the cause of the Prophet and became a chief supporter of his creed and claims. He succeeded Abu-bekir in 634 A. D. He declined the title "Caliph," Successor, as too exalted; and chose rather to be called "Emir," Commander. It was through his command the Hejeira (Flight) was adopted as the point from which the followers of Mohammed should date their years. It was by his genius that the Arabian Empire was founded. Under his irresistible advance, Syria and Palestine were conquered, and he built the Mosque of Omar which still stands central in Jerusalem. He subdued Egypt and Persia, and brought for the first time all the Arabian tribes under one creed and authority. An act of injustice, not usual with him, it should be said, incurred the resentment of a Persian slave, and he was assassinated 644. He was buried near Mohammed.

O'mar Khayyam (*khī-yam'*), a Persian poet and astronomer, was born at Nishapur, in Persia, about the middle of the 11th century. Khayyam is his poetical name, and was taken from his father's business as a tent-maker. He was educated under one of the great Persian teachers, and offered a place at court, but refused, and was given a

pension instead. He reconstructed the calendar, making it, as Gibbon says, "very much superior to the Julian, approaching in accuracy to the Gregorian style." He wrote mathematical treatises in Arabic, one on algebra, which has been translated into French. He was better known as an astronomer than as a poet, until 1859, when Edward Fitzgerald, published a translation of his *Rubáiydt* or quatrains, which gave him a place among the true poets, though the translation is deemed much finer than the original. His astronomical work brought on him the suspicion of heresy, which his poem did not remove, and to allay the feeling against him he made a pilgrimage to Mecca. He died at Nishapur in 1122. See *Letters and Literary Remains of Fitzgerald*, Vol. III.; *Rubáiydt.*

O'mer Pasha (*pash'ä*), was born at Plaski, in Croatia, a province of Austria, in 1806. His real name was Michael Lattas. He fled, in fear of punishment, from the Austrian army to Bosnia. Here he became a Mohammedan, and was made writing-master to Abdul Medjid, then heir to the Turkish throne. When Medjid became sultan, he made Omar Pasha governor of Lebanon. When the Russians invaded the European dominions of Turkey, he was sent with an army of 60,000 men against them, and successfully withstood them at Kalafat, and after their withdrawal from the country entered Bucharest in triumph, August, 1854. He embarked for the Crimea in 1855, and defeated 40,000 Russians at Eupatoria. He was sent to Bosnia and Herzegovina when in insurrection, September, 1861, and after settling their difficulties he attacked Montenegro, capturing the city Cetinjé; and in 1867 he led a command against the insurgents in Crete. He was governor-general of Bagdad, and also minister of war from Bagdad at different periods. He died at Constantinople, April 18, 1871.

On'ega, Lake, in the north of Russia, northeast of Lake Ladoga, and after it the largest lake in Europe. It is 146 miles long and 50 miles wide, covering 3,764 square miles. It has but one outlet, the river Svir, flowing into Lake Ladoga. There are numerous islands and bays, and abundance of fish. It is closed by ice for 156 days in the year, but has a large traffic on its waters at other times. A ship canal, 145 miles long, to connect it with the White sea, is planned, the surveys being finished in 1890.

Onei'da, Lake, one of the numerous lakes of central New York. It is 23 miles long and about 5 miles wide, and flows through the Oneida river into the Oswego river. It lies 11 miles northeast of Syracuse.

Onta'rio is the wealthiest and most prosperous province of the Canadian Dominion. Its distinguishing natural features are the Great Lakes (Superior, Huron, Erie, and Ontario), which wash its shores, and the river St. Lawrence, the great highway of its commerce to the sea. The river Niagara forms part of the water system of the province, connecting Lakes Erie and Ontario. About midway in its course it is broken by the well-known falls of that name; but by means of the Welland canal communication between the two lakes is practicable for vessels of considerable burden. Of recent years, the magnificent water-power of the Niagara Falls and of the Lachine Rapids in the St. Lawrence has been utilized for electrical purposes and to furnish water-power for many important manufacturing industries. As features of striking interest in the physical geography of the province, it may be stated that the surrounding Great Lakes, although they are at four diverse levels, in reality occupy only two distinct stages, separated by the Niagara Falls. This will be seen when we state that below the cataract is Lake Ontario, 247 feet above the sea; above it are Lakes Erie (573 feet), Huron and Michigan (581 feet), and Superior (602 feet). The other important lakes within the province are Nipissing, Nipigon, Simcoe, the Rideau lakes, the Muskoka chain, and, at the western end of the province, Lake of the Woods. The total area of Ontario is 222,000 square miles. The population, in 1901, was 2,167,978. Its chief cities are Toronto, on Lake Ontario, the provincial capital and seat of the Ontario government (population 207,971); Ottawa, on the river of the same name, the administrative capital of Canada and the meeting place of the Dominion Parliament (population 59,902); London (population 37,983); Hamilton (population 52,550); Kingston (population 18,043); and Brantford (population 16,631).

A hundred years ago, the whole of what is now called Ontario (formerly known as Upper Canada) was a forest wilderness, and its capital, in early days designated "Little York," was unknown, save as a small French trading post. In 1793, its foundations were laid by Governor Simcoe, the first administrator of the province, who also made it the provincial capital. In 1834, it was incorporated as a city, when it assumed the Indian appellation which it now bears,—namely, Toronto. To it the rich province of Ontario, with not a little of the vast northwest, is tributary. Besides being the seat of the provincial legislature, it is the seat of the law courts and universities, and the chief home of industry and commerce. Here are many of the higher educational institutions of Canada, including the University of Toronto, with 1,300 students; the university of Trinity college; Victoria and McMaster universities; Wycliffe, Knox, and St. Michael's colleges; Upper Canada college, and the school of practical science. Several other towns of note in Ontario have, besides their thriving industries, interesting social centers, important seats of learning. One of these is Kingston, with its university of Queen's college, under its enthusiastic and learned principal, the

Very Rev. George M. Grant, D.D.; another is Ottawa, with its University of Ottawa. There are also colleges at Woodstock and at Sandwich; ladies' colleges at Hamilton, London, Brantford, Whitby, Oshawa, and St. Thomas; and the Ontario Agricultural college at Guelph. As the older part of the province is now largely intersected by railways, manufactures have arisen and have been given a great impetus, while denser settlement has been facilitated. But that section of the province, from the Ottawa to the Detroit rivers, and from Lakes Erie and Ontario to Lake Huron and the Georgian bay, is not now all of Ontario, though it is its chief cultivated and populated area. It extends far northward and westward, along the line of the Canadian Pacific railway — the north shore of the Great Lakes to the Lake of the Woods, its northwestern frontier, adjoining the province of Manitoba; while its northern boundary is James bay, and its northwestern the Albany river. In these higher latitudes, the climate of the province is in winter severe, with the thermometer not infrequently falling to 40 degrees, and even to 50 degrees below zero. In the more settled peninsula, however, the winters are much milder, and the summers are seldom oppressively hot, the tempering influence of the lakes modifying the heat and making the season delightful.

Onta'rio, Lake, one of the five Great Lakes of North America. It lies between the Canadian province of Ontario on the north and New York state on the south, and has an elevation of 250 feet above the sea. It is the smallest of the group, covering 7,240 square miles, and being 190 miles long and 55 miles wide. It forms the connection between the Niagara river and the St. Lawrence. The level of its waters varies about three and a half feet at regular periods, of from four to seven years, which it is thought may be due to an underground river. The Welland canal connects it with Lake Erie, the Oswego canal with the Erie canal and Hudson river, and the Rideau canal with Ottawa. It is subject to storms, the agitation of its waters by which, may account for its seldom freezing, except along the shore.

On'yx. See MARBLE.

Oogonium (*ō'ō-gō'nĭ-ŭm*) (in plants), the female organ in thallophytes. It consists usually of a single cell, which produces a solitary egg, the oosphere. It may be a special cell set apart for this purpose from its beginning; or it may be an ordinary nutritive cell, which later becomes modified into an egg-producing cell. See THALLOPHYTES.

Oosphere (*ō'ō-sfēr*), the general name for the female sex cell or egg in plants. See EGG.

O'ospore (in plants), the general name for the spore which results from the fertilization of an egg by a sperm. The oospore is sometimes called a "fertilized egg," and in plants which have a distinct alternation of generations, the oospore in germination always produces the sporophyte.

O'pal is a mineral, something like quartz, composed mainly of silica and water. It is never found in crystals, and is very easily broken. There are many kinds, so nearly resembling each other as to be with difficulty distinguished. The finest kind, known as precious opal, noble opal, or oriental opal, is partially transparent, and of a bluish or yellowish white, with a beautiful play of brilliant colors produced by small fissures which refract the light. It is never cut in facets, as diamonds are, because its play of colors is better on a convex surface. It is used in jewelry. The ancients valued the opal very highly, the Roman senator Nonius preferring exile to giving up an opal to Mark Antony. This was valued at $500,000. The most celebrated opal now known belongs to the imperial jewels at Vienna, and is five inches by two and a half inches in size. The finest opals are brought from Hungary, and are usually very small, but even a small one, if perfect, is worth twenty or twenty-five dollars. Opal is also found in Saxony and in South America. The common opal is white, yellow, green, red, or brown, but without any play of colors. It is not at all rare, occurring in veins and holes in rocks. Wood opal is wood turned into opal, the mineral having taken the place of the woody structure.

Op'era is a drama which is sung, accompanied by a full orchestra, or chorus of musical instruments. It makes use of the aria or song, duets, trios, the recitative or declamation, instrumental interludes, or whatever the situation requires. The introduction or opening is called an overture. There are three chief classes or schools, the Italian, the German, and the French. The Italian opera is the earliest, dating as early as 1600, and is noted for its melody. Scarlatti (1659–1725) may be considered its founder. The most famous modern Italian composer is Rossini, his *Barber of Seville* and *William Tell* both retaining a place on the modern stage. Bellini, Donizetti, and Verdi are other well-known composers of this school.

The early opera in Germany was Italian, Dresden and Vienna being the centers. The national school was founded at Hamburg by Keyser, who wrote more than 100 operas (1694–1734). Mozart's first work was Italian in form, though surpassing them in their own field; but his *Magic Flute* was the first national romantic opera. Beethoven composed but one opera, *Fidelio*, while Weber used the national folklore in his *Der Frieschütz* (Free Archer) with great effect. Melodrama originated in Germany. The singer recites his part in a speaking voice, while the music of the orchestra seeks to give the meaning of the scene to the audience.

The French grand opera school was founded by a Florentine, Sully, and reformed by the

German composer, Gluck, while Cherubini, Rossini, Myerbeer, and Wagner were foreigners who aided in its development. The French school paid particular attention to rhetoric, and the use of the recitative or recitation has always been prominent. Italian opera became the fashion in London from the time of Handel, and was introduced into America in 1825. See *Memoirs of the Opera*, by Hogarth; *Essays on Modern Opera*, by Edwards.

Op'era Glass, an instrument for making distant objects appear brighter and more distinct. An ordinary opera glass is essentially two telescopes, of the type employed by Galileo, mounted in one frame so as to produce two images of the same size, one for each eye. The principle of the opera glass is therefore exactly the same as that of the astronomical telescope, except that the latter uses a converging eyepiece, while in the opera glass a diverging eyepiece is used. The reason for this difference is twofold, namely, the diverging eyepiece gives an upright image and the total length of the opera glass is the difference between the focal lengths of the object lens and the eye lens. This makes the opera glass short, so that it can be easily carried in the pocket. If a converging eyepiece were used, the distance between the objective and the eye lens would have to be equivalent to the *sum* of their focal lengths, which would make

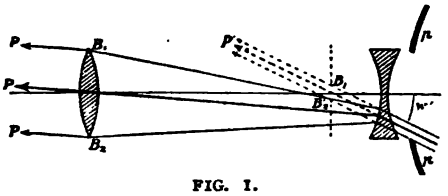


FIG. 1.

the instrument unwieldy. The optical behavior of the opera glass will be clear from the accompanying figure, where B_1 B_2 indicates the object glass, through which pass three rays from a very distant object P. The pupil of the eye is indicated by p p, and the image of P is seen erect in the direction indicated by the three rays P_1. The principal focus of either lens falls at some point within the eye. Note that the angle which the image subtends at the eye is very much greater than that under which the object is seen with the naked eye.

Zeiss of Jena has recently introduced an enormous improvement into the ordinary opera glass, by using (instead of two Galilean telescopes) a pair of astronomical telescopes. But he avoids the difficulty of extreme length, mentioned above, by placing between the two lenses a pair of prisms such as is shown in the accompanying figure. The path of the ray between the two lenses is thus doubled upon itself, securing a short length for the instrument and at the same time giving an erect image, and a large, clear field.

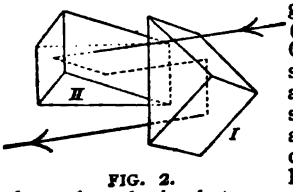


FIG. 2.

These prisms allow him also to place the two objectives a foot or so apart, while the eye lenses are at a distance suited to the eyes.

Equipped with such a glass, a field officer can stand behind a tree in safety while he is watching the operations of the enemy. It need hardly be added that the armies and navies of all civilized countries are now furnished with these glasses.

Ophir (*ō'fẽr*), a place mentioned in the Bible, from which the navy of Solomon brought gold, precious stones, sandalwood, etc. The voyage took three years. It was either on the eastern coast of Africa, in Arabia, or in India, but in which of the three countries is doubtful. Josephus places it on the peninsula of Malacca.

O'pie, John, an English painter, was born at Cornwall, England, in May, 1761. His attempts at portrait painting secured him the help of "Peter Pindar" (Dr. Wolcot), who took him to London, where he was known as the "Cornish wonder." His *Murder of Rizzio*, *Jephtha's Vow*, *Presentation in the Temple*, and *Juliet in the Garden* are his most noted works. He illustrated Boydell's *Shakespeare*, Macklin's *Poets* and *Biblical Gallery*. He also wrote the *Life of Reynolds*, and lectured on art. He died at London, April 9, 1807.

O'pium is the dried juice of the unripe seed vessels of a kind of poppy. The poppy is cultivated in India, Persia, and China, as well as in Turkey and in Egypt. It requires a very rich soil, and irrigation is often used as an aid to its cultivation. The main opium district in India is a large tract on the Ganges, about 600 miles long and 200 broad. In India the seed is sown in November, the plant blossoms in January or later, and in three or four weeks after, when the poppy heads or capsules are about as large as a hen's egg, the field is ready for work. The collector takes a small instrument made of four little knives tied together, looking like the teeth of a comb, and with this cuts or scratches the poppy heads. This is done in the afternoon, and the next morning a milky sap can be collected from the heads by scraping with a kind of scoop into an earthen vessel. The vessel is kept turned on its side so that any watery fluid may drain out, and as the juice dries it is turned often, so that it will dry equally. It takes three or four weeks before it is thick enough to be used in the factories. It is then thrown into great vats in the factories and kneaded, and made into balls or cakes, which are dried and packed in chests for the market. Opium has a bitter taste and a peculiar, heavy odor. It is poisonous, but makes a most

valuable medicine, in which form it is used to allay pain and produce sleep. The habitual use of the drug is known as opium-eating or the opium habit, and is made use of to relieve pain or sleeplessness, when it soon becomes a habit most difficult to overcome. The amount usually taken is about three grains a day, though De Quincey (himself a slave to the habit) says that he used sometimes 8,000 drops of laudanum (a form of opium) daily. It acts as a stimulant, followed by feelings of depression and nervousness, requiring a fresh dose to remove them. Another way in which it is used is in smoking, a practice most common in China and in India. The opium prepared for smoking is called "chandu," and is a watery extract about twice as strong as the drug. A piece of opium as large as a pea is placed in a small cup at the end of a pipe and lighted, and the smoke inhaled. The opium is distilled by the process, and there is very little morphine in the smoke. There are said to be a million opium smokers in the United States. Its excessive use wrecks the constitution and seems to destroy also the moral faculties. For the opium wars, see CHINA. See *Opium and the Opium Appetite*, by Calkin; *Opium Smoking in America and China.*

Oporto (*ō-pōr'tō*), the second city in Portugal, is situated on the Douro river, three miles from the Atlantic shore. The city climbs the steep banks of the river, its houses, gayly painted, making a bright picture set off from the pine-covered mountains behind it. On one of the crags overlooking the river is a crystal palace surrounded with gardens. The old cathedral was built by Henry the Navigator; the old Gothic church was founded in 559, and the former monasteries are used, one as a citadel, one as an exchange, and one as barracks. There is a medical school, observatory, art academy, library of 250,000 volumes, and two picture galleries. The railroad to Lisbon crosses the river a little above the city on one of the finest arch bridges built. The manufactures are of cloth, silk, hats, porcelain, ribbons, tobacco, soap, and metal casting; distilling, cork cutting, and sugar refining are among the industries. It is the chief seat of the export trade in port wine. Oporto was the stronghold of the Christians in the peninsula against the attacks of the Moors. The people opposed the usurper, Miguel, in 1828, who executed many of them; but they supported Pedro of Brazil, and withstood the besiegers thirteen months. Population 138,860.

Opos'sum, the name given to a number of animals representing the marsupials, or pouched animals, in the New World. There are some sixteen species, varyingin size from a cat down to a mouse. Some are provided with pouches on the under side of the body in which the young are reared, and others have no sign of a pouch. The Virginia opossum is common from the central United States to Brazil. It is one of the largest members of the group, being about the size of a cat. The fur is dirty yellow, the ears and feet are black, and the tail is scaly and used for grasping. This form has a well-developed pouch. The young, often to the number of thirteen, are born in a helpless condition, and, with the help of the mother, are attached to the breasts — which number thirteen — covered by the pouch. They live on trees and are active mainly at night. They feed on insects, small reptiles, eggs, and the like. Their habit of feigning death when frightened or slightly injured is well known. They get very fat, and are highly esteemed as food by the colored people. There are a number of species in South America. In those forms without a pouch, the young, when fully developed, are frequently carried on the back, with their tails twined around that of the mother.

OPOSSUM.

Op'tics. See LIGHT, TELESCOPE, CAMERA, EYE, OPERA GLASS, MICROSCOPE, PHYSICS.

Or'acle, the name given in ancient times to a revelation made by some god in answer to questions, and also to the place where the revelations were given. The revelations were usually made by the mouths of priests or priestesses, and sometimes by other signs. At Dodona, the oracle answered by the motion of leaves, or the murmuring of the waters of a fountain, and the oracle of Ammon responded by the shaking of the statue of the god. The Egyptian temples were nearly all oracles, and there were oracles among the Babylonians and Phœnicians. The most famous oracle of the Greeks was the one at Delphi. The inquirers offered sacrifices, walked around the oracle with laurel crowns on their heads, and inscribed their questions on leaden tablets, many of which have been discovered. The answer was accepted as final and having authority, and usually was just and reasonable. Other oracles were at Ismenus, Delos, and Olympia. See *Greek Oracles*, by F. W. H. Myers; *Religious Antiquities*, by Schomanns (translated).

Oran (*o-ran'*), a city in Algeria, is situated on the gulf of Oran, 260 miles southwest of Algiers. The harbor is protected by moles, built in 1880. The city lies at the foot of a hill, defended by forts, and has two citadels. There is a Roman Catholic cathedral, a Mohammedan mosque, a military hospital, a college, and a seminary. The principal exports are alfa, iron-ore, and grain. The city

was founded by the Moors, and in the 15th century was very prosperous. It was famed for its cloth and arms, as well as for its fine public buildings. In 1509, the Spaniards, after taking it, made a penal settlement of it. Captured by the Turks in 1708, it was retaken by the Spaniards in 1732, who abandoned it in 1790, after it was almost destroyed by an earthquake. The French took possession of it in 1831. Population 85,801. Oran is also a department in Algeria, area 44,616 square miles, with a population, embracing both the military and the civil territory, of 1,028,248.

Or'ange, the fruit of *Citrus aurantium* and its varieties. To the same genus belong the limes, citrons, grape fruits, etc. All the species of the genus are natives of tropical and subtropical Asia, but are now extensively cultivated throughout the warmer regions of the world. In the United States, the orange cultivation centers in Florida and California. There are numerous cultivated forms, the so-called "navel oranges" being an accidental variation. Among the commoner forms are the common sweet orange, a native of India, among whose most prized cultural forms are the Washington navel and Riverside navel; and the mandarin or kid-glove orange, a native of China, various cultivated forms being known as mandarins and tangerines.

Or'ange, a city of Essex county, N. J., twelve miles west of New York. The name includes also parts of the townships of East Orange, West Orange, and South Orange, which are all suburbs of New York, often called the Oranges. The region around the city is laid out in beautiful parks, with elegant homes, rising above each other, ending in a broad crest on the top of Orange mountain, 650 feet in height. Llewellyn park, of 50 acres, is on the eastern slope of the mountain. The city has manufactures of hats and shoes, and in the northern part is the beautiful Rosedale cemetery of 50 acres. At South Orange is a Roman Catholic college and Theological seminary. Population (of the city) 24,141.

Or'ange River, the largest stream in South Africa, flowing west into the Atlantic ocean. It is 1,000 miles long, but is navigable only in the rainy season, and its mouth is obstructed by a bar.

Or'ange River Colony. This British possession in South Africa, after having existed for 46 years as an independent republic, under the name of the Orange Free State, was, after military occupation by the British forces, in consequence of the Boer war, annexed by proclamation May 4, 1900, and is now known as the Orange River Colony. The area of the colony is about 48,326 square miles, the total population being, in 1890, natives included, 207,500. Of this number, about 80,000 were white, who chiefly engaged in agriculture, and in the raising of sheep, cattle, horses, goats, ostriches. This population is chiefly of Dutch origin. The colony was founded by the Boers who trekked from Cape Colony in and after 1836, and was declared independent in 1854. It lies between the Vaal and the Orange rivers, on a plain rising from 3,000 to 5,000 feet elevation, with bluffs or slopes toward the rivers that border it, and dotted with kopjies, or flat-topped hills. The prevailing religion is that of the Dutch Reformed church; while the Roman Dutch law has hitherto been in use. Bloemfontein is the capital, with a present population of about 4,000. The undulating plains of the interior here afford excellent grazing. The colony is known to be rich in coal-mines; while in and on the borders are valuable diamond mines, the yield from which, as well as from garnets and other precious stones, has been phenomenally large. A railway, constructed by the Cape Colonial government, connects the Orange river (at Norval's Point) with the capital, as well as with the Transvaal, lying to the north of it. The length of the railway lines in the colony is about 400 miles. There are 1,500 miles of telegraph lines in the colony, giving communication with Cape Colony, Natal, the Transvaal colony, and Basutoland. See the TRANSVAAL, also CAPE COLONY, and the BOER WAR, in this *Cyclopædia.*

Orang-outang (*ō-rang'ō-tang'*), one of the higher apes found in the swampy forests of Borneo and Sumatra. With the chimpanzee and the gorilla, they approach closely to man in structure. A full-grown male reaches a height of four feet and four inches, but the outstretched arms cover seven feet eight inches. The body is bulky and covered with long, reddish-brown hair. The legs are short, but the arms are so long as to reach the ankles when the animal is erect, and, in walking, the knuckles are placed on the ground. Thy are, however, awkward on the ground and prefer the trees, where they can travel five or six miles an hour, without especial effort, by swinging along on the branches, which they grasp mainly with their hands. They feed on fruits and succulent shoots. They retire to rest at sundown in nests made of broken boughs, and placed twenty or thirty feet above the ground. In captivity they are not so active and intelligent as the chimpanzee. See APE.

ORANG-OUTANG.

Orato'rio, a sacred story set to music, and accompanied, as in the opera, with a chorus

and orchestra or band of musical instruments, but without the use of scenery or costumes or acting. Its name is derived from the oratory of the Church of Santa Maria Maggiore near Rome, where, from 1571 to 1594, musical performances of this class were first arranged. The oratorio was produced in Rome in 1600, the same year in which the first opera was given in Florence. The first development of the oratorio had the passion of Christ for its subject, and the greatest passion music is the *St. Matthew*, written for service on Good Friday, by Sebastian Bach, in 1729. The next form was the "epic," used by Handel in fifteen grand oratorios, the greatest of which are *Israel in Egypt*, and the *Messiah*, and by Haydn in his *Creation*, and Mendelssohn in *Elijah*. The modern oratorio uses more of the dramatic element, and inclines to the form of a cantata, of which Liszt's *St. Elisabeth*, and Schumann's *Paradise and the Peri*, are fine examples. See *Standard Oratorios*, by Upton.

Orcagna (*or-kän'yä*), **Andrea di Cione,** an Italian painter, sculptor, architect, and poet. He was nicknamed "Arcagnuolo" (archangel), of which Orcagna is a corruption. He was born about 1316, at Florence, his father being a sculptor and worker in silver and his elder brother a painter. He was appointed architect of the Church of San Michel at Florence, in 1335, and his greatest work is the marble tabernacle of this church, which is considered one of the most beautiful art-creations of Italy. He was also chief architect of the cathedral at Orvieto. The frescoes of the *Last Judgment* and *Christ and the Virgin*, in the Church of Santa Maria, at Florence, still survive as examples of his painting. His work was studied by succeeding painters, especially by Michael Angelo and Raphael. He died about 1376. See *Painting in Italy*, by Crowe and Cavalcaselle.

Or'chardson, William Quiller, R. A., a Scotch painter, was born in 1835, at Edinburgh, where he studied art. He is considered to belong to the first rank of genre painters, that is, a class of paintings whose subjects are taken from everyday life. His pictures, many of the later of which are fashionable interiors, and portraits are very popular and exquisitely finished. Among the best known are, *The Challenge*, *The Bill of Sale*, *Hard Hit*, *After*, *The Salon of Madame Récamier*, *The Rift within the Lute*, *Her Mother's Voice*, and *The Young Duke*.

Orchids (*ôr'kĭds*), species of a great monocotyledonous family, the *Orchidaceæ*, containing over 6,000 species. Their greatest display is in the tropics, where many of them are brilliantly colored epiphytes. There are many beautiful species, however, in the temperate regions, chiefly in bogs. The flowers are very much modified, always having a conspicuous spur, at the bottom of which nectar is secreted. Among the best known forms are the common lady-slippers or moccasin flowers (*Cypripedium*), in which the spur is

LADY-SLIPPER.

replaced by a conspicuous sac, the so-called "slipper" or "moccasin." Orchids are very highly specialized in reference to pollination by insects. Each kind of orchid has its own kind of insect, and all of the elaboration of the flower is connected with this fact. In greenhouses, orchids are among the most prized of plants, on account of the showy colors and the strange forms of the flowers, the most conspicuous being the epiphytes from the tropical forests. See *Orchids, their Culture and Management*, by Watson.

Ord, Edward Otho Cresap, an American general, was born in Cumberland, Md., Oct. 18, 1818. He served in the Seminole war in Florida, and on the frontiers, until the beginning of the Civil war, when he became brigadier-general of volunteers, and was given command of Pennsylvania reserves, and gained the battle of Dranesville (December, 1861). In May, 1862, as major-general of volunteers, he was given a command in the department of the Mississippi, and took part in the battle of Iuka and the capture of Vicksburg. In 1865, he was in command of the army of the James, and the department of Virginia, and was in the battles that ended the war. After the war he became a brigadier-general in the regular army, had command of various departments, and retired in 1881 with the rank of major-general. He died at Havana, Cuba, July 22, 1883.

Or'egon, one of the Pacific states of the Union, and the twentieth admitted (Feb. 14, 1859). It is divided into two unequal parts by the Cascade mountains, which are about 130 miles from the coast, while the coast range is within 25 miles of the Pacific shore. The Cascade range rises 6,000 or 8,000 feet with high peaks, among them Mt. Hood (11,225), Mt. Jefferson (10,200), Mt. Pitt (9,818), all being extinct volcanoes. On the

east are the Blue mountains and Powder river mountains, from 8,000 to 10,000 feet high. The state is 360 miles broad and 270 miles long; its area is 96,030 square miles, and is almost twice as large as New York state. The capital is Salem (population 4,258) and the chief cities are Portland (population 90,426), Astoria, and Baker City. There are 330 miles of coast, with a narrow strip of land and several fertile valleys. The part of the state west of the Cascade range is the most valuable, two-thirds of it being occupied by the Willamette valley, which is rich in farms and villages, where the crops never fail, and where half of the population and the wealth of the state are found. The eastern part of the state is very varied, having pasture lands and grazing grounds in the north, and in the south the Great Basin, an arid region larger than France, requiring irrigation to make it productive. Great beds of lava, plains covered with sage brush, rivers sinking away into shallow lakes or marshes, and brackish lakes in which fish cannot live are the features of this region, which is crossed by the Stein mountains. Crater lake, in the southwest of Oregon, is one of the deepest fresh-water lakes in the world, and is formed by the snows filling an extinct crater. In the center rises Wizard island, 845 feet high, with an extinct crater at the top. A large area, including this lake, has been set aside as the Oregon National Park. Other lakes are the Upper and Lower Klamath lakes, Lake Harney, and Lake Wallowa, 6,000 feet high, on the Blue mountains.

The Columbia river is 1,200 miles long, one-fourth of it forming the northern boundary of Oregon. It is six miles wide at the mouth, and has a fall of 850 feet near the Cascade mountains, where the government has built a canal, 3,000 feet long. The Willamette, 200 miles long, the Umpqua, and the Rogue, Des Chutes, Umatilla, with the Snake river on the eastern boundary, are other rivers of Oregon. The climate of the western part of Oregon is mild, with an excessive rainfall. The climate is affected by the southwestern trade winds, the ocean currents from Japan, and the protection of the Cascade range, making it much warmer than regions in the same latitude on the Atlantic coast. Eastern Oregon has very little rain, and is colder, though the Rocky mountains protect it from blizzards. Oregon has coal fields, iron ore, in veins from six feet to 15 feet thick, and mines of gold, silver, manganese, and quicksilver. As an agricultural state, its largest crop is wheat, while oats, flax, rye, barley, and buckwheat give large crops. The hop gardens employ large numbers of Chinese, and the prune orchards are among the best in America, while its apples and cherries are noted. Stock raising is an important industry, as cattle and sheep can be kept outdoors all winter. The Oregon pine and the red fir, making the finest of ship timber, with oak, cedar, hemlock, maple, and ash trees, furnish material for its great lumber industry, while its rivers supply the large trade in salmon canning. There are, besides a professional school, nine colleges and universities for men and for both sexes, with 110 instructors and 1,200 students in all departments. The State university, at Eugene, Ore., with a large national land grant; the State Agricultural college at Corvallis; Willamette university, with a college of arts, conservatory of music, and a woman's college, with law and medical colleges at Salem; Albany (Presbyterian) college; McMinnville (Baptist) college; Pacific university at Forest Grove; the Indian training school near Salem, with 180 boys and girls from thirty different tribes; and many normal schools and academies, with a fine system of free schools, furnish the educational equipment of the state.

Oregon was originally the name for all the land between Alaska and California, and was claimed by Spain, Russia, France, Great Britain, and the United States. Spain ceded her rights in 1819, and Russia in 1821, and the Louisiana Purchase settled those of France. In 1811, Astoria was founded by John Jacob Astor, and from 1818 to 1846 the United States and Great Britain by treaty occupied the land together. In 1846, the boundary between the state and British America was fixed, and Oregon territory was formed in 1848, and in 1859 a part of it was made into the state of Oregon. Population 413,536.

O'Reil'ly, John Boyle, an Irish-American poet, was born at Dowth, County Meath, Ireland, June 28, 1844. His father being a teacher by profession, he was given a fine education. He studied journalism from typesetting to the writing of editorials. Although a Fenian, he enlisted in the Tenth Hussars with the intention of exciting a revolt. Being discovered, he was tried for treason, convicted, and banished to Australia in 1866. Escaping from that country he reached the United States in 1869, and became the editor of the *Boston Pilot*. Some of his poems were of high merit and attained deserved popularity. He published a number of volumes of songs and sketches which are now but little known. He died at Hull, Mass., Aug. 10, 1890.

Orellana (*o-rāl-yä'nä*), **Francisco,** a Spanish adventurer, was born at Truxillo, Spain, about 1490. He went with Pizarro to Peru in 1535, sharing in the conquest of that country. In 1540, Pizarro, while exploring the country east of the Andes, sent Orellana with sixty men in a boat down the river Napo after supplies. In three days Orellana reached the Amazon, and, finding it difficult to return, sailed down the river to the sea, being the first European to adventure on its waters. His journey occupied seven months, reaching the ocean in August, 1541. He reported in Spain that he had passed through a country inhabited only by women, who were warriors,

and where gold was used to roof the houses. He obtained a grant of the land along the river, and sailed with four ships and 400 men, but lost his ships and his men, and died of fever after entering the Amazon, about 1550.

Orestes (*o-res'tēz*), a Greek hero, the son of Agamemnon and Clytemnestra. His father was murdered by Clytemnestra and her lover Ægisthus, but Orestes was saved by his sister Electra, and brought up at the court of his uncle in Phocis. His cousin Pylades joined with him in his efforts to avenge his father's death, the pair going secretly to Argos and killing Clytemnestra and Ægisthus. But realizing that he had killed his mother, Orestes became mad and fled from land to land, pursued by the Furies. Learning from Apollo that he could be cured of his madness by bringing the statue of Diana from Tauris in Scythia to Athens, he and Pylades journeyed there, but were seized to be sacrified by the natives. The priestess Iphigenia recognized her brother in Orestes, and with her help they all escaped, carrying the statue with them. Orestes recovered his father's kingdom at Mycenæ, and married Hermione. The story of Orestes is a theme for the tragedies of Euripides, Sophocles, and Æschylus.

Or'gan, one of the largest musical instruments. It is a wind instrument having a large number of pipes, which produce the sounds on admission of air, which is carried to them by means of a bellows. It is played by keys and pedals. The most usual form of the organ is that seen in churches, which consists of four and sometimes five parts, each part being almost a separate instrument. These are called the great organ, the swell organ, the pedal organ, the choir organ, and the fifth part, when it exists, is called the solo organ. Each has its own keyboard, but they are brought close together so that one performer can reach them all. The pedal organ is played with the feet, while the other keyboards are reached by the hands. There is also a system of stops, within reach of the performer's hand, which closes or opens the pipes as the keys do. Organ pipes are made of metal and of wood. The ancient organ was worked by water, and was used in the Roman theatres, Nero being one of its earliest patrons. In the reign of Honorius, 400 A. D., no nobleman's house was complete without an organ, and small ones were carried by slaves from house to house. Constantinople was the great home of organ building in the ancient world, and the first organ built in mediæval Europe was patterned after one brought by Byzantine ambassadors on a mission to Charlemagne. The use of the bellows in organs dates from the time of the Emperor Julian, in the 4th century, though it did not come into general use until the end of the 9th century. The smallest organs ever built were made in the monasteries; they were called regals, and could be held on the palm of the hand. The largest organs in England are those of the Royal Albert hall, Alexandra palace, Crystal palace, St. Paul's cathedral, London, St. George's hall, Liverpool, and the Leeds town hall. Among the largest in the world are the organs at Seville, Haarlem, Rotterdam, and Utrecht. The great organ in the music hall of Boston gave the first impulse to organ building in America. There are large ones now at the cathedrals in Montreal and Boston, the Music hall in Cincinnati, Fremont hall, Boston, Brooklyn tabernacle, and the Auditorium in Chicago.

The AMERICAN ORGAN, called cabinet organ, is a reed organ, the outgrowth of the melodeon, in which reeds are used but not pipes, and the wind is forced in by bellows worked by the feet. The Mason and Hamlin Organ company, founded in 1854, built the first cabinet or parlor organs, making use of an invention of Hamlin's, which consisted in twisting and bending the reeds, so as greatly to improve the tone. These organs have been improved, and are now made in all styles and sizes, some of the larger being nearly equal to pipe organs. There are nearly 100,000 sold yearly in the United States.

Or'igen, one of the most celebrated of the Christian Fathers, was born at Alexandria, 185 A. D. His father was a Christian and a teacher of rhetoric, and he was early trained for public life. Clement of Alexandria was his especial instructor in the principles of Christianity. His father suffered martyrdom when Origen was a young man, and he then sought to support the family by opening a school himself. Bishop Demetrius appointed him master of a famous seminary for catechumens, and having mastered the Hebrew language he soon became an authority upon questions of doctrine and polity. Nevertheless, his opinions were not popular with the ecclesiastics, and he was subjected to many trials, and finally excommunicated in 231. He was received at Cæsarea, where he reopened his school with increased popularity. But the persecutions which followed under Maximinus and Decius drove him to such extremes of suffering that he died at Tyre in 254 A. D. Origen was the first great New Testament exegete that ever lived. He devoted himself to every form of study which promised to throw the least light upon the great problems of theology and philosophy. He practiced the strictest asceticism, and voluntarily subjected himself to the most abject poverty. His work was greatly rewarded in the conversion of multitudes, among whom were many of the leading men of the east. His talents, eloquence, and learning excited the praise of even the heathen writers; and while his doctrinal views have not been wholly accepted by any considerable portion of modern christendom, his purity, unselfishness, and devotion to his Master are beyond praise.

Orinoco (*ō-ri-nō'kō*), one of the great rivers of South America, rises in Venezuela. It divides into two branches near Esmeralda, one flowing south into the Negro river; the other branch, joined by the Guaviare, turns north and passes over the cascades of Maypures and Atures, where the river, 8,000 feet wide, narrows to 20 feet, falling over cascade after cascade, like a series of steps, and shut in by islands and rocks. The Meta and the Apure rivers now join the Orinoco, which flows on, four miles wide, receiving the waters of two more streams before it reaches the delta. About 120 miles from the Atlantic, the delta begins, covering 8,500 square miles and stretching along 165 miles of coast. Of these many channels by which the river empties into the Atlantic, only seven are navigable. The Orinoco is 1,550 miles long; 900 miles are navigable to the falls, and 500 miles above the falls. The river usually floods the country in its course from May to January, the overflow sometimes stretching across for 100 miles. Humboldt and Schomburgh are the great explorers of the Orinoco.

Oriole (*ō'ri-ōl*), any one of a family of Old World birds. The true orioles are related to the crows, and are not to be confused with the so-called orioles of the New World. The latter make a strictly American family, extending from Patagonia into the United States. The two families of birds, although entirely distinct, resemble each other in color, the prevailing shades being yellow and black. It was this circumstance that led to the use of the name for the American birds. The true orioles are common in southern Europe and abundant in Oriental and Australian regions. The golden oriole is yellow and black in color, and makes a hanging nest. It is common in southern Europe, but is rarely found in the British Islands.

Orion (*ō-rī'on*), a hero in Greek mythology, a handsome giant and hunter, in Bœotia. At Chios he fell in love with Eos, or Merope, and cleared the island of wild beasts to please her. When drunk he insulted her, which her father, with the help of Bacchus, avenged by putting out his eyes. He recovered his sight by exposing his eyeballs to the rising sun. There are several stories of his death; one that he was killed by Diana, whose hunter he became, because Eos had carried him off to Ostygia and offended the gods; another that Apollo, angry with Diana's love for Orion, seeing him swimming in the water, pointed out to her a black object, challenging her to hit it, and she shot it with her arrow, finding, when too late, that it was the head of her lover; a third story lays his death to the sting of a scorpion.

Ori'on, the brightest constellation in the northern heavens, is named after the Greek hero Orion, who was placed, with his hound, among the stars, and pictured with a girdle, sword, lion's skin, and club. The three bright stars across the center of the constellation are called Orion's belt.

Orizaba (*ō-rē-sä'bä*), a volcano in Mexico, 15 miles north of the city of Orizaba. It is 18,205 feet in height. The last severe eruption was in 1566.

Ork'ney Islands, a group of islands off the north coast of Scotland. Twenty-eight of the ninety islands forming the group are inhabited, the largest being Pomona. The island of Hoy has fine cliffs and a hill 1,564 feet high, but the other islands are low and treeless, with many small lakes. Farming and fishing and straw-plaiting are the principal industries. On Pomona is a group of large standing stones, arranged in two circles, the inner circle of 100 feet across and the outer one 360 feet across, the largest stones being in the smaller circle. The two towns of the islands are Kirkwall and Stromness. At Kirkwall is the cathedral of St. Magnus, founded in 1138, and a museum with many ancient relics, among others a collection of pins, brooches, bracelets, and silver coins, thought to belong to the earliest period of Scottish history, found on the islands in 1858. The Orkneys, first inhabited by the Picts, were conquered by Norse rovers, and belonged to Scandinavia till 1468, when they were given to James III. of Scotland as a pledge for the payment of the dowry of his wife, Margaret of Denmark. The pledge was never redeemed, and in 1590 on the marriage of James VI. with the Danish princess Anne, Denmark relinquished her claim to the islands. The population, which is partly Scotch and partly Scandinavian, numbers 36,438. See *Orkneys and Shetland*, by Tudor; *Description of the Isles of Orkney*, by Wallace.

Orleans (*ôr'le-anz*), a French city, situated on the Loire river, 75 miles southwest of Paris. The Forest of Orléans, covering nearly 150 square miles, is near it. The ancient walls and gates of the city have, since 1830, been made into boulevards. The Loire is crossed by a bridge 364 feet long. The noted buildings include the cathedral destroyed by the Huguenots in 1567, and rebuilt by Henry IV. and his successors; a museum, and the house of Joan of Arc. There are three statues of Joan, a bronze one having been erected in 1855. The chief industry is market-gardening, and there are some manufactures, but its trade is of most importance, as it is a railroad center, besides having river and canal routes. Orléans was a Celtic town, called Genabum, in 52 B. C., when the Gauls arose there against Julius Cæsar. About 272 A. D., it was named Civitas Aureliani (City of Aurelius), of which Orléans is a corruption. Besieged by Attila in 451; twice plundered by the Northmen; in 1428, it was attacked by the English and delivered by Joan of Arc, called the "Maid of Orleans." During the Huguenot wars it suffered severely, and in the Franco-

German war was held a month by the Germans, and then became the headquarters of the army of the Loire, until its defeat Dec. 3–5, 1870. See *Life of Joan of Arc*, by Michelet. Population 66,619.

Or'leans, Duke of, the title which has been used by three different French dynasties. It was first granted in 1302 by Charles VI. to his brother Louis, who was afterward regent. His grandson became king as Louis XII. in 1498, and the dukedom was merged with the crown. In 1626, Louis XIII. made his brother Jean Baptiste Gaston, duke of Orléans and Chartres, who died childless. The title was granted by Louis XIV. to his brother Philippe, whose son Philippe and grandson Louis Philippe Joseph (Égalité) bore the title. Louis Philippe, son of "Égalité," was duke of Orléans during his exile, until he became king, when his son Ferdinand succeeded to the title. The Comte de Paris, late the head of the Bourbon house of France, has not used the title, which is assumed by his son, the present claimant to the throne of France, Louis Philippe Robert, who resides at Brussels. In French politics, the adherents of the princes of the Orléans family are called Orleanists.

Or'leans, Louis Philippe Joseph, Duke of, best known as "Égalité," was born at Paris, April 13, 1747. He led a dissipated life, and was looked upon coldly by Louis XVI., who disliked his habits, and by Queen Marie Antoinette, who objected to his companions. He became an intimate friend of the then Prince of Wales, in his visits to England, and brought back to France the English vices of horse-racing and hard-drinking. He made himself popular, however, by his profuse charity, opening to the poor the splendid gardens of the Palais Royal. His hostility to the court, and especially to the queen, made him take part against the king, while lavishing his wealth in scattering liberal books and papers throughout the country. He led the forty-seven nobles, who in June, 1789, joined the deputies of the third estate, and helped to change the states-general into a national assembly. He seems to have plotted to become some day a constitutional king, but was not responsible for many of the revolutionary movements, such as the storming of the Bastille, and the march of the women on Versailles, with which he was charged by the Royalists. In September, 1792, when all titles were swept away, he asked for a new name, and took the name of Égalité (equal). He voted for the death of the king. His eldest son, afterward King Louis Philippe, was on the staff of Dumouriez, and went with him into the Austrian camp, and at once, with the other Bourbons left in France, Égalité was imprisoned and by the Jacobins, when they gained power in the convention, he was convicted of conspiracy on slight evidence, dying on the guillotine, at Paris, Nov. 6, 1793.

Or'monde, James Butler, first duke of, lord-lieutenant of Ireland, was born at London, in 1610. He was brought up by the archbishop of Canterbury as a royal ward, his father being dead and his grandfather a state prisoner. In 1640, he was given command of the royal army in the rebellion in Ireland, and managed affairs with ability, though giving satisfaction to none of the numerous parties in Ireland. He sided with Charles in his Irish government, and retired to France when the parliamentary party was successful, but returned and made an effort to restore the royal power. In 1650, he went back to France, and served Charles II. during his exile, accompanied him on his return, and was at two different periods again made lord-lieutenant of Ireland. He was attacked by assassins under Colonel Blood, perhaps instigated by his enemy, the Duke of Buckingham, in 1670, but escaped uninjured. He died in Dorsetshire, England, in 1688.

Ornithol'ogy. See BIRDS.

Orontes (*ō-ron'tēz*), the ancient name of a river in Syria. It rises near Baalbek, and flows north between Lebanon and Anti-Libanus, as far as the city of Antioch, and then flows westward to the Mediterranean. It is 247 miles long, and in the lower part, its rocky banks, 300 feet high, are covered with climbing vines, myrtles, laurels, figs, and sycamores.

Orpheus (*or'fē-us*), a Greek hero, thought to be the son of Apollo and Calliope (*ka-lī'ō-pē*), one of the Muses. His home was in Thracia, where many different places claim to be his birthplace. Orpheus, by his music on the lyre, given him by Apollo, moved men and beasts, trees and rocks. On his travels with the Argonauts, his music rocked monsters to sleep and stopped falling cliffs. When his wife Eurydice died, Orpheus followed her to the lower regions, and his "golden tones" prevailed with Pluto, who allowed him to take her back, provided he did not look around while they ascended; but looking back he lost her forever. According to some traditions, he was killed by a thunderbolt of Zeus for revealing the divine mysteries, and by others he was torn in pieces by the Mænades, and buried at the foot of Mt. Olympus, where a nightingale sings over his grave.

Orsini (*or-sē'nē*), **Felice,** an Italian conspirator, was born in December, 1819, at Meldola, Italy. He studied at Bologna. As the son of a conspirator he was early admitted into secret societies, and was sent to the galleys for life in 1844. Pius IX., by an amnesty, restored him to liberty, but he was soon imprisoned for taking part in political plots. During the revolution of 1848, he took part in the defense of Rome and Venice, and was active at Genoa and in the duchy of Modena, and after its suppression lived for some years

in England, where he was intimate with Mazzini. In 1854, while stirring up insurrection in Milan, Trieste, and Vienna, he was arrested and sent to the fortress of Mantua, whence he escaped in 1856 and fled to England. There he supported himself by lecturing and wrote *Austrian Dungeons in Italy*. He at last planned the assassination of Napoleon III., the great obstacle, as he thought, in the way of Italian independence. With three associates he stood near the opera house in Paris, on the evening of Jan. 14, 1858, and when the emperor's carriage drove up, threw three bombs under it, which exploded, killing ten persons and wounding 146, but not injuring the emperor or empress. He and one companion (Pieri) were guillotined, March 13, 1858, the others being sentenced to penal servitude. See *Memoirs and Adventures*, by himself.

Or'tolan, a class of birds belonging to the finch family. It is about six inches long, with head, neck, and breast of a yellowish gray, with brown wings. It builds its nest of dry grass on the ground in open fields, though sometimes under low bushes. They are found in summer as far north as the Arctic circle, and in winter south as far as Abyssinia and India. They are caught in large numbers in nets when on their journeys, and fattened in dark rooms, as their flesh is considered a great delicacy. In Japan, they are pickled with spice and vinegar. The Romans gave large sums for them, and they are still highly prized in Italy.

Or'ton, James, an American naturalist, was born at Seneca Falls, N. Y., April 21, 1830, and died in Peru, Sept. 25, 1877. In 1867, he went with an expedition through South America and found the first fossils discovered in the valley of the Amazon, and made a journey from Para to Lima, in 1873, and after another tour through Peru, died in crossing Lake Titicaca. His published works include, *The Andes and the Amazon*, *Underground Treasures*, and *Comparative Zoology*.

O'sage Orange, a tree, native of North America, somewhat like the mulberry. It was found growing in the country of the Osage Indians, which, with its yellow globes of fruit, gave it its name. It is also called mock orange. It grows from 20 to 60 feet high, and is a very valuable tree for its wood, which is yellow, fine grained, takes a high polish, and is very durable. It is used for posts, paving blocks, etc. The leaves are used for feeding silkworms in place of the mulberry, with a difference of opinion as to the result. The fruit, large and round, with a rough skin, has a woody pulp and bitter juice, and is not eaten. The tree has been largely used in America as a hedge plant, for which its rapid growth, thorny branches, and freedom from disease adapt it.

O'sages, a tribe of American Indians of the Dakotah family. They were found by Marquette on the Missouri in 1673, but were driven by their enemies to the Arkansas. They fought with the French against the English, and against the Chickasaws. They ceded their lands at different times to the government, and in the Civil war about 1,000 of the tribe went south. In 1870, the tribe was removed to the Indian territory and placed in charge of the Quakers, where they have grown more civilized, having a school and cultivating about 2,000 acres of land.

Osaka (*ō-sä'kä*) or **Ozaka,** the second largest city in Japan, situated at the head of the gulf of Osaka. It covers about ten square miles, and is crossed by canals with more than 1,000 bridges. The fine castle, built of enormous stones, in 1583, and the palace, which was destroyed in 1858, were perhaps the handsomest buildings in Japan. The city is the headquarters of the rice and tea trade, and the commercial center of the empire. The harbor does not admit of very large vessels. There is a foreign settlement, occupied mostly by missionaries. Population 821,235.

Os'car II., Frederic, king of Sweden and Norway, was born at Stockholm, Jan. 21, 1829. He is the great-grandson of Napoleon I.'s famous general, Marshal Bernadotte, the first king of the new independent kingdom of Norway; he succeeded his brother, Charles XV., in 1872. He has followed the policy of his brother, carrying out reforms and reorganizing the army and the railroads. He has published a volume of poems, a translation of Goethe's *Faust*, and a sketch of Charles XII.

Osceola (*os-ē-ō'lä*), a chief of the Seminole Indians, was born in Georgia, in 1804. His father was an English trader, and his mother the daughter of an Indian chief, who took him to Florida when a child, where he became influential among the Indians. His wife, the daughter of a runaway slave, was taken from him, and for his threats of revenge he was seized and imprisoned for six days by General Thompson, whom he killed, with four others, six months afterward. This was the beginning of the second Seminole war. At the head of a band of 200 or 300 Indians and runaway slaves, he carried on the contest for nearly two years, in the almost impenetrable Everglades. On Oct. 21, 1837, while holding a conference under a flag of truce, he was treacherously seized and imprisoned at Fort Moultrie, S. C., where he died Jan. 30, 1838. He is the hero of Mayne Reid's story, *Osceola*.

Osh'kosh, Wis., the county seat of Winnebago county, is situated at the confluence of the upper Fox river and Lake Winnebago in a thickly-settled and fertile region. Being naturally the center of the lumber interests of the Fox and Wolf rivers, it early became commercially important, and has now a population of 28,284. Besides its numerous sawmills, it is noted for its extensive manufacture of sash, doors, and blinds, matches, carriages,

sleighs and farm wagons, trunks, furniture, logging tools, grass-twine goods, and canned goods.

It has fine public schools and churches, several large parochial schools, a state normal school, a state fish hatchery, and three miles north is the Northern State hospital. The city has two hospitals, two parks, a beautiful library building of classic design, five banks, two daily papers, three railroads, a line of steamers for lake and river commerce, and an electric railway system connecting the city with Neenah, Menasha, and Appleton. Near by is Lake Winnebago, a sheet of water thirty miles long and twelve miles broad; it is famous for its fishing and its beautiful summer resorts, and tourists come from afar to enjoy its waters.

O'sier. See WILLOW.

Osiris (*ō-sī'ris*), the greatest of Egyptian gods, is the son of Set (the earth) and Nut (heaven). He was slain by Set, his father, and avenged by his son, Horus. He judges the dead in the lower world. He is represented usually in human form, and always with the head of a man. His symbols are the evergreen and the tamarisk, and a kind of ibis, with long plumes.

Osman Digna (*ŏs-măn' dĭg'na*), a leader of the Sudanese Arabs, was born at Suakim about 1836. His father and grandfather were both slave-dealers; and the son followed the same calling, having marts for his slaves at Khartum and Berber on the upper Nile. The rebellion of the Mahdi broke out on the White Nile in December, 1881, Osman having himself prepared the way for a revolt against the authority of the khedive. On Aug. 3, 1883, Osman was defeated before Suakim by Tewfik Bey. He lost a second battle, September, 1885; and won a third, Dec. 21, 1888. In this engagement he met Gen. Sir F. Grenfell. On Feb. 21. 1891, he returned in force to be routed anew; and again, in 1894, he appeared at the head of a new army to be driven off by the Egyptian cavalry. At daybreak, April 8, 1898, General Kitchener, in command of the English and Egyptian contingents, sent to restore order in the Sudan, encountered two divisions of Dervishes under command of Emir Mahmoud and Osman Digna on the Al-bara. Mahmoud was captured, but Osman again escaped. Out of the 20,000 Dervishes under them, 2,000 were slain. Once more the Sudanese were rallied; and on Sept. 6, the battle of Omdurman was fought, and 11,000 Sudanese were slain, while the wounded were reported as 16,000. The khalifa, who had succeeded Mahmoud, and Osman Digna fled, leaving their dead and wounded to the care of the English conquerors.

Osman', Nubar Pasha, a Turkish general (pasha signifying governor), was born at Tokat, in Asia Minor, in 1832. He was educated at the military schools of Constantinople and became a cavalry officer. He fought in the Crimean war; took part in suppressing the rebellions in Syria (1860); in Crete (1867), and in the Yemen (1874). He was commander of the Fifth army corps in the Turkish army at the outbreak of the Russo-Turkish war in 1876; was commandant at Widdin; and, after being driven back from Scalevitze, he intrenched and maintained his army at Plevna almost four months, despite the fierce bombardment of the Russian forces. He was, however, forced to surrender, Dec. 10, 1878, at which time he still commanded 43,000 men. His sword was returned to him by the czar, and he was promoted by the sultan to be minister of war in 1878. He was also made governor of Crete. In 1894, he became grand marshal of the palace. He died at Constantinople, April 4, 1900.

Os'prey. See FISHHAWK.

Ossian (*osh'ian*), the great Gaelic poet, was, according to tradition, the son of Fionn MacCumhail, who lived in the 3d century A. D. Fionn gathered a band of warriors about him whose adventures constitute the literature of the Feinn. Ossian is said to have been carried away to the "isle of the ever-young," and when he returned, old and blind, to have told these stories of the Feinn. Ossian is best known through the work of James MacPherson, who in 1760, 1762, and 1763, published *Fingal*, a poem in six books; *Temora*, another poem, in eight, and some shorter pieces, all claiming to be translations of Ossian, the son of Fionn or Fingal. They brought him fame and wealth, and were translated into nearly every European language, Goethe, Schiller, and Napoleon being among his admirers. But Dr. Johnson, with others, attacked them as forgeries, claiming that there was no Gaelic literature as ancient as the original of Fingal claimed to be. The truth seems to be that these translations were largely the work of MacPherson, and the Gaelic texts were prepared with or without the aid of his friends; but the heroic literature of the Gael on which his work was founded remains. See *Ossian*, by Clerk; *Reliques of Gaelic Poetry*, by Brooke.

Ostend (*ŏs-tĕnd'*), a watering place in West Flanders, on the German ocean, 77 miles northwest of Brussels. Its sea wall, 3 miles long, 40 feet high, and 105 feet broad, forms a fine promenade, and two wooden piers projecting on each side of the harbor are used for the same purpose. It is the resort from July to September of from 20,000 to 25,000 visitors from Germany, Russia, and all parts of the continent. It is an important fishing station, has a school of navigation, a lighthouse, and manufactories of linen, sailcloth, candles, and tobacco. It dates from 1072; was besieged by the Spaniards from July 7, 1601, to Sept. 20, 1604; surrendered to the

allies in 1706, and to the French in 1745. Since 1865, it has been without fortifications. Population 38,481.

Osteopathy (*ŏs-tē-ŏ'pă-thĕ*), a system of treating diseases by manipulation, which was invented by Dr. A. T. Sill, then of Baldwin, Kan., but later of Kirksville, Mo., where a large school has been founded. The system takes its name from the theory that all diseases are "caused by some displacement of some bone which causes obstruction to the flow of one of the fluids." This trouble it is sought to remove by manipulation of the parts affected, permitting the "free operation of the fluids of the body," in which, it is asserted, all medicinal virtues by nature inhere. Special legislation in several western states permit the graduates of osteopathic schools to practice as licensed physicians.

Os'trich, the largest living bird, a native of the plains and deserts of Africa. The wings are small and not adapted for flight, but the bird is a swift runner. It is said to go at the rate of a mile a minute with a stride, when under full speed, of twenty-two to twenty-eight feet. The male ostrich reaches a height of seven feet and weighs from one hundred and fifty to two hundred pounds. It is called the "camel-bird." The male has black feathers on the body, and white ones on the wings and tail. The latter are the plumes of greatest value. The female is plainer. The head and neck are unfeathered in both. There are three species of ostriches in Africa, they live in small flocks and are timid and difficult to approach. They are hunted on horseback, and advantage is taken of the fact that they run in a circle. About ten eggs are laid in a hole in the sand, and sat upon by the male at night, and by the female by day. These eggs are from five and one-half to six inches in longest diameter, and are equivalent to about twenty-four eggs of the common fowl. The shell is so thick and strong that it has been used as a water vessel by South African tribes. In their native haunts, ostriches feed on grass, herbs, insects, and reptiles, but, in captivity, they swallow nearly everything not too large. Ostrich plumes have been used for ornament and adornment from ancient times. The ladies of ancient Rome were fond of these beautiful feathers. The plumage of the adult bird is assumed about the third year. One bird will yield feathers of a value from 40 to 150 dollars at a plucking. The quality of the feathers depends upon the pasturage. Ostrich farming is now carried on in Cape Colony, Australia, Buenos Ayres, California, and other places where the African ostrich has been introduced. See Douglass' *Ostrich Farming in South Africa;* Martin's *Home Life on an Ostrich Farm.*

AFRICAN OSTRICH.

Oswe'go, a city of New York, is situate on Lake Ontario, at the mouth of the Oswego river, 35 miles from Syracuse. It is divided by the river, which is crossed by three bridges, and has five miles of water frontage on the river, and two and a half miles on the lake. It is the chief port on the lake, with a breakwater and lighthouse, and has five miles of wharves and a dozen elevators. Fort Ontario guards the harbor. The city is built on slopes rising to 100 feet, and the shore of the lake is a bluff from 40 to 50 feet in height. The public buildings include the court house, city hall, state armory, and a public library. The river has within the city a fall of 34 feet, which is used as water-power for flour mills, knitting mills, foundries, and iron works, making steam shovels, dredges, and steam engines; there are also woolen factories, car works, and breweries. The factory for corn starch is one of the largest in the country, covering more than four acres. The state normal school is located here. Oswego was a trading post of the English in 1720, and in 1727 a fort was built there. It was taken by the French in 1756, and by the British in 1812. It became a city in 1848. Population 22,199.

Othman (*ŏth-măn'*) or **Osman I.,** surnamed "The Conqueror," was born in Bithynia, in 1259. When the Mongols overthrew the sultanate of Iconium, in 1299, he seized a portion of Bithynia. Then forcing the passes of Olympus, he took possession of the territory of Nicæa, and gradually subdued a large part of Asia Minor, and thus became the founder of the present empire of Turkey, called from him the Ottoman empire. He died in 1326. See TURKEY.

Ot'ho I. or **Ot'to the Great** was born in 912. He was the son of Henry I., emperor of Germany, and succeeded his father in 936. His reign was very successful; many tribes were brought by him into subjection; he held almost supreme power in Italy, both over the kings of Lombardy and the popes of Rome; he consolidated the German empire, and established Christianity in both Scandinavian and Slavonic lands; dying in Prussian Saxony, in 973.

O'tis, Elwell Stephen, an American soldier, was born at Frederick, Md., March 25, 1838, and graduated at Rochester university, N. Y., in 1858. He studied law at Harvard and graduated there in 1861. On Sept. 13, 1862, he entered the volunteer army as a captain (140th N. Y.), and was mustered out June, 1865, as brevet brigadier-general "for distinguished

services." He was appointed lieutenant-colonel in the regular army, July 28, 1866, and rose to be brigadier, Nov. 28, 1893. He was appointed major-general of volunteers and assigned to the Philippine islands, May 4, 1898, where he took chief command on the departure of General Merritt for Paris. He became military governor of the islands in 1899, and was appointed one of the Philippine commission in the same year. He was promoted major-general in the regular army, January, 1900. General Otis was a famous Indian fighter during the years 1867–81, and published a book, *The Indian Question*, in 1878.

ELWELL STEPHEN OTIS.

O'tis, Harrison Gray, an American statesman, was born at Boston, Mass., Oct. 8, 1765. He studied at Harvard college, and was admitted to the bar in 1786. Sent to the state legislature, in 1796, he soon became leader of the Federal party. He was one of three commissioners sent in 1814 by Massachusetts to Washington, to present to the government the subject of the damages inflicted on the New England states by the war with Great Britain. As United States senator in 1820, in the debate on the Missouri question, he strongly favored the restriction of slavery. He was a popular orator, and opposed the antislavery movement in his later years. He died at Boston, Oct. 28, 1848.

O'tis, James, an American statesman and orator, was born at West Barnstable, Mass., Feb. 5, 1725. He studied at Harvard and at Boston, was admitted to the bar at Plymouth in 1748, and moved to Boston in 1750. In 1760, when advocate-general, the revenue officers asked his aid in obtaining from the superior courts search warrants by which they could enter any man's house in search of smuggled goods. Otis considered this illegal and refused, resigning his position and appearing on behalf of the people. His speech on the subject lasted five hours, and made a great impression, John Adams saying of it afterward: "The child Independence was then and there born." He was elected to the assembly, and was a delegate to the Stamp Act congress, which met in New York the same year; and a member of a committee of that body to prepare an address to the English house of commons. While in the Massachusetts legislature, the governor of the state requested that a letter on relief from taxation, sent to the other colonies, should be taken back by the legislature. Otis opposed the governor's requisition in a speech called by his opponents "the most treasonable declaration ever uttered," and carried the house with him by a vote of 92 to 17. He was severely beaten by some revenue officers in Boston in 1769, and lost his reason as a consequence of a sword cut on his head. He published several political pamphlets, *The Rights of the Colonies Asserted* being the best known. He was killed by lightning May 23, 1783, while standing at the door of his home at Andover, Mass. See *Life*, by Tudor.

Ot'tawa, the capital of the Dominion of Canada, is situated on the Ottawa river, 120 miles from Montreal. The government buildings are on a bluff, called Barrack hill, 150 feet above the river; they form three sides of a square, and include a fine library building, with 160,000 volumes, and the Victoria tower, 180 feet in height. The governor-general's house (Rideau Hall) is about a mile from the city. The Episcopal bishop of Ontario and Roman Catholic bishop of Ottawa have their residences in the city. There is a Catholic cathedral and college, a normal school, ladies' college, musical academy and art school, and a fine museum. The Chaudière falls, 40 feet in height, on the Ottawa river, and a smaller fall on the Rideau river, give a fine water-power, and supply the many lumber mills, flour mills, and factories of the city; while the Rideau canal across the city, the Gatineau and the Du Lièvre rivers increase the facilities of the lumber trade, which is the great industry of the region. Flour, matches, ironware, brick, and leather are also manufactured. Ottawa was founded in the last part of the 18th century by a Bostonian named Wright. He called the village Hull, a place now having 12,000 inhabitants. He sold the lots on which Ottawa now stands to a man to whom he was in debt for labor. In 1823, Colonel By was sent by the British government to survey the Rideau canal, and the settlement was for a time called Bytown. The name was changed to Ottawa in 1854, and in 1858 it became the capital of the Canadian Dominion. Population 59,902.

Ot'tawa, one of the largest rivers of British America, rises about 300 miles north of Ottawa city, flows west 300 miles to Lake Temiscamingue, and then 400 miles southeast into the St. Lawrence, where its two mouths form the island of Montreal. It sometimes widens into lakes, and then narrows to 120 or 150 feet, but with its branches carries on its waters perhaps the largest lumber trade in the world. The navigation of the river is improved by a system of canals and slides, made necessary by its many falls.

Ot'tawa, Ill., the capital of La Salle county, at the junction of the Illinois and Fox rivers, in northern-central Illinois, 82 miles southwest of Chicago. It is situated in a rich region, and has a considerable trade in the shipping of grain, lumber, and produce; besides growing manufacturing industries, which include window glass, glass bottles, lamp chimneys, pottery, tile roofing, drain tile, sewer pipe, firebrick, carriages, wagons,

organs, saddlery, and harness, agricultural implements, etc. Population 10,588.

Ot'tawas, a tribe of American Indians of the Algonquin family, living, when first found by the French explorers, in the northern part of Michigan. They fled from the Iroquois beyond the Mississippi, to the country of the Sioux, and after war with them went back to Mackinaw. They joined with the French, and after the settlement of Detroit a part of the tribe lived near by. At the close of the last war of the French for Canada, their chief, Pontiac, headed a great conspiracy against the English. In the Revolutionary war, they helped the English, but finally joined in the Indian treaty of Greenville, Aug. 3, 1795. A band of them settled on the Miami river, and when their land was ceded to the United States, a tract 34 miles square was reserved to them on the Miami. Other bands have taken up lands in the Indian territory, while some are still found on the shores of Lake Superior and in Canada.

Ot'ter, an aquatic carnivorous animal related to the weasel, and highly valued on account of its fur. Otters inhabit both the Old and the New Worlds. They have an elongated low body, with short limbs and webbed feet. The American form is about four feet long; it ranges over nearly all the temperate zone of North America and is fond of sliding down slopes into the water. In winter, it also slides on the snow. They feed almost exclusively on fish. The common otter of Great Britain and Europe is similar in form, but shorter, being about two feet long without the tail, which is about seventeen inches long. The fur is soft, of a brownish color, lighter on the throat and below. They are expert swimmers and divers and easily overtake fish which they bring to shore to devour. In some parts of India and China the otter is taught to catch fish, and also to assist in driving them into nets. The sea otter which is a related form, belonging, however, to another genus, lives about the Aleutian Islands in the North Pacific. It does not feed on fish but on clams, sea urchins, and crabs. Its fur is very valuable.

OTTER.

Ot'terburn, Battle of, "the hardest and most obstinate battle ever fought," according to Froissart, took place near Otterburn, a small village in Northumberland, England, about sixteen miles south of the Scottish border, and thirty-two miles from Newcastle. Douglas, with his Scottish army, carried away Hotspur's pennon from Newcastle, saying that he would plant it on his own castle. "You shall not carry it out of Northumberland," swore Hotspur (Harry Percy). So the Scots encamped on a slope near Otterburn to give him time to regain his pennon. Hotspur, with 8,600 men, nearly four times the Scotch force, attacked their camp. Douglas, hewing the way before him with his mace, fell mortally wounded, anxious only to hide his death from his followers till they had won the victory, saying: "Long since I heard a prophecy that a dead man should win a field, and I hope in God it shall be I." The Scots gained the day, taking Harry Hotspur and his brother, Robert, prisoners. The date of the battle is Aug. 19, 1388. The Scotch ballad of *Otterburn* and the English ballad of *Chevy Chase* tell the story of this battle. See *History of the Battle of Otterburn*, by White; and Percy's *Reliques*.

Ot'toman Empire. See TURKEY.

Ottum'wa, a city in Wapello county, Ia., is on Des Moines river, 85 miles southeast of Des Moines. Surrounded by a fertile country, with fine water-power, it has a large trade, and manufactures carriages, woolen goods, sewing-machine attachments, and agricultural implements, with flour, starch, and linseed-oil mills. It is in the heart of the Iowa coal fields. Population 18,197.

Oudenarde (*ou'den-dr'de*), a town in Belgium on the Scheldt, 33 miles west of Brussels. It is noted as the scene of the famous battle of Oudenarde, brought on by the efforts of the French to retake the city from Marlborough, who had captured it in 1706. It was the third of Marlborough's four great victories, and was gained July 11, 1708.

Oudinot (*ō'dē-nō'*), **Nicolas Charles,** duke of Reggio, and marshal of France, was born at Bar-le-Duc, France, April 25, 1767. Entering the army at seventeen, he won distinction, gaining the cross of the Legion of Honor in 1805. He was made commander of ten battalions, which became famous as "Oudinot's grenadiers." He was at Austerlitz and Jena, and won the battle of Ostrolenka, Feb. 18, 1807. For his brilliant services in the Austrian campaign of 1809, he was made marshal of France and duke of Reggio. He was given charge of the occupation of Holland in 1810, and served in the Russian campaign and in the battles of 1813 between the French and Austrians. He was one of the last to leave Napoleon, but left him entirely, remaining on his estates during the "Hundred Days." He was made minister of state, commander of the royal guard, and a peer of France after the second restoration, and in 1823 commanded the first division of the army of Spain, and was for a while governor of Madrid. He died at Paris, Sept. 13, 1847. See *Napoleon and His Marshals*, by Headly.

Outram (*ōtram*), Sir **James,** a famous English general, the "Bayard of India," was born in Derbyshire, England, Jan. 29, 1803. He was educated at Aberdeen, and entered the Indian service as a lieutenant in the Bombay infantry. In 1839, as aid-de-camp to Sir John Keane, he took his famous ride of 335 days across Afghanistan, disguised as an Afghan merchant. He defended the British residency at Hyderabad against 8,000 Beluchis in February, 1843, and in 1854 was given the highest office in India, the residency of Lucknow. After a brilliant campaign as commander of the Persian expedition, he landed in India to find the mutiny raging, and was offered the command of the forces marching to the relief of Lucknow. He yielded the position to his old lieutenant, Havelock, who had already fought eight successful battles with the rebels, and accompanied the army as commissioner from Oudh, and serving in the army as a volunteer. After the relief of the city, he took command, and was in turn besieged, holding out against great odds until relieved by Sir Colin Campbell (afterward Lord Clyde). In recognition of his services he was made lieutenant-general, and created a baronet. He spent the winter of 1861–62 in Egypt, and died at Paris, March 11, 1863. He was buried in Westminster Abbey, and statues of him are erected at London and at Calcutta. See *Life* by Goldsmid.

Ou'zel, a popular name given to several birds, mostly of the thrush (*Merulidæ*) family. In Shakespeare and in Tennyson the blackbird is called an ouzel, but in America it is for the most part restricted to small birds which look like land birds but which are aquatic in their habits. The American "water ouzel" resembles a catbird in appearance, is solitary in its habits, and lives along the banks of dashing streams. It will surprise the spectator by dropping suddenly into a brawling mountain cataract, and then appear swimming along through the pools by the use of its wings, or, it may be, running swiftly along the bottom of the stream by means of its feet. Its food is composed of small mollusks or aquatic insects and their larvæ, which it seeks among the stones at the bottom of the brook.

O'vary (in plants), the name of that bulbous part of carpels or pistils which contains the ovules. As the term ovary is already well established among animals in connection with the organ which produces eggs, its present application in flowers is extremely unfortunate, since the ovary of flowers holds no relation to a female sex organ. It has been suggested on this account that the term "ovulary" be substituted for it in flowers. See FLOWER.

O'verbeck, Friedrich Johann, a noted German painter, was born at Lübeck, Prussia, in 1789, and studied at Vienna and at Rome. He, with four others, founded a school of art that had much influence in Europe, though they were mocked at with such names as "Pre-Raphaelites" and "Nazarites." A Madonna, painted in 1811, brought Overbeck into notice, and he was employed by the Prussian consul to execute frescoes in his house at Rome illustrating the story of Joseph. His chief work is a fresco at Assisi, *The Vision of St. Francis.* Among his famous pictures are *Christ's Entry into Jerusalem,* at Lübeck; *Christ's Agony in the Garden,* at Hamburg; *The Incredulity of St. Thomas,* at London. His drawings, as well as his paintings and frescoes, have many of them been engraved. He died at Rome, Nov. 12, 1869. See *Life,* by Atkinson, in the "Great Artists" series.

O'vertones', sometimes called "harmonics," are a series of weak tones which accompany the production of any given note on a musical instrument. The lowest string on a guitar is called an "E string," because, when plucked, the lowest and the loudest note which it can emit is E. This note, E, is, therefore, called the "fundamental." If we denote the number of vibrations per second in this fundamental note by unity, then the series of fainter notes, which accompany the fundamental whenever the string is plucked, will have frequencies which are denoted by the numbers 2, 3, 4, 5, 6, 7, etc. These secondary notes are called "overtones" or "harmonics." They are very marked in the case of stringed instruments provided with sounding boards (such as the piano and violin), and add greatly to the richness of the tone. They are nearly absent in the case of the tuning fork, and hence the pure, but thin tone of the fork.

Ov'id (Publius Ovidius Naso), the Latin poet, was born in Italy, March 20, 43 B. C. He was educated at Rome, his father putting him under the best of teachers to train him for the bar. He soon gave up the practice of law and went to Athens, Asia Minor, and Sicily. His first success was won by his tragedy, *Medea.* Then followed his *Epistles,* imaginary love-letters. His *Art of Love,* his masterpiece, was published in three books. The *Metamorphoses,* in fifteen books, contains some of the finest work in ancient literature. The *Fasti,* only six books of which were finished, is a poetical commentary on the calendar, giving the origin of Roman feast days, etc. He was banished by the Emperor Augustus to Tomi, on the Euxine, south of the mouth of the Danube, for some unknown offense. He admitted that the punishment was deserved, but says he was rather the witness than the author of the crime. In 9 A. D., he left Rome, making his home for the last eight years of his life at Tomi, constantly writing appeals to the emperor for a release from the sentence of banishment. Here he wrote the *Tristia,* in five books, and *Letters,* in four, making him one of the most prolific of Latin poets. He died in 17 A. D.

O'vulary. See OVARY.

O'vule (in plants), the peculiar megasporangium of seed-plants, which in gymnosperms is exposed upon a scale, and in angiosperms is inclosed within that part of the carpel called the ovary. It is the ovule which, after fertilization, becomes the seed. The ordinary ovule consists of the following parts: one or two "integuments," which are distinguishable only above, and which leave a narrow passage-way (micropyle) through which the pollen tube passes; the "nucellus" or main body of the ovule, inclosed by the integuments, and containing the single large megaspore ("embryosac"). Ovules are of various sizes, and occur in various numbers in ovaries, from solitary to almost innumerable. Various modifications of ovules have received technical names, which are of no special value to the general student.

Vertical section of a flower-bud, showing sepals (*s*), stamens (*a*), and an ovule (*kk*) with two integuments.

Ow'en, Sir **Richard,** a British naturalist, was born at Lancaster, England, July 20, 1804. He studied medicine at Edinburgh and London, but soon began his work in zoology and comparative anatomy, by preparing catalogues of the collections in the museum of the Royal College of Surgeons, and lecturing on comparative anatomy. In 1856, he became superintendent of the natural history department of the British museum, a position favorable for his studies on living and fossil animals. He visited Paris and made the acquaintance of Cuvier, with whose name his will always be connected in the science of zoology. Owen's researches in zoology number nearly 400; they are largely devoted to structure, and embrace every class of animals from a sponge to man. He produced monographs, or important papers, on the pearly nautilus, the Venus flower-basket, king crab, the mudfish, anthropoid apes, and many extinct birds and reptiles. Among his voluminous writings are, *Comparative Anatomy of Invertebrates* (1855), *Comparative Anatomy and Physiology of Vertebrates* (1855), *The Skeleton and the Teeth, History of British Fossils, Reptiles, Birds, Mammals.* He died Dec. 18, 1892. See Owen's *Life of Richard Owen* (1894).

Ow'ensboro, Ky., a city on the Ohio river, the capital of Daviess county, in northwestern Kentucky, 150 miles southwest of Louisville. The city stands high, and in a fertile region, both in regard to agriculture and its mineral products. Its chief industry, however, is tobacco, of which there are some 25 factories and stemmeries; there are also a number of whiskey distilleries; foundries and machine-shops; lumber, flour, planing, and steam-shingle mills; sewer-pipe and brick works. There are good schools, churches, and public buildings. It is served by the Louisville and Nashville, and the Louisville, St. Louis, and Texas railroads. Population 13,189.

Owl, a bird of prey with a flat face and rosette of feathers about the eyes, making them appear large and conspicuous. There are about two hundred species of owls throughout the world. For the most part, they are birds of night and pass the day in secluded and dark places. A few, like the snowy owl and the hawk owl, are day birds. The common owls feed, for the most part, on smaller birds and field mice. Since the latter are very destructive to crops and vegetation the owls should be protected, if for no other reason than for their war upon these rodents. The screech owl, or mottled owl, is one of the commonest in the United States. It nests about houses. It is quiet during the nesting season, but after the young are reared, in July and August, its voice may be heard at night. It is not a screech, but a tremulous, quavering sound of mournful quality. The barred owls are next in abundance. They live in deep woods and their cry of *whoo—whoo—who!* gives them the name of hoot owls. They destroy many mice. The eared owls, or horned owls, have tufts of feathers on their head like small horns. The great horned owl is common and one of the strongest and best known of our owls. The snowy owl, a beautiful bird either pure white or barred with black, nests in the north and visits the United States in winter. It is a day owl. It feeds on fish, birds, and sometimes carrion. The burrowing owl is a small western owl living in the holes of prairie dogs. The barn owls belong to a distinct but closely related family. They have long faces, the feather discs on which are nearly triangular, and they are often called monkey-faced owls.

LONG-EARED OWL.

Ox'ford, a city of England, and the seat of the University of Oxford, is situate near the union of the rivers Cherwell and Thames, 52 miles from London. The two rivers form a rectangle, on which the old part of the city stands. In the center of the town, called "Carfax,"

meaning four-forked, the four main streets cross each other, running north and south, and east and west. Besides the university buildings, there is St. Michael's church, with its tower, built in 1070; the Clarendon building, used for the Clarendon press until 1830; the Indian institute, with a library and museum for the use of members of the India service or natives of India; Godstow, a ruined nunnery; St. Barnabas, St. Aloysius, and St. Aldgate's churches, and the Church of All Saints; Somerville Hall, and Lady Margaret Hall, colleges for women; Wycliffe Hall, a theological school; the town hall and public library. A cross, known as the Martyr's Memorial, was erected in 1841, in honor of the Oxford martyrs, Ridley, Latimer, and Cranmer. The Port Meadow is an open common, and the university parks are kept in order by the university. Oxford is mentioned in the Saxon Chronicle as far back as 912 A. D. The tower, now St. Michael's church, was built by the Norman conquerors and commanded the approach to the north gate of the city, which was removed in 1771; Empress Maud (Matilda) took refuge in Oxford when driven from London by Stephen of Blois (1142); and in 1258, the reform known as the "Provisions of Oxford," was the work of the "mad parliament" sitting at Oxford; and in the civil war it was for a few years the seat of the parliament and court of Charles I. Population 53,000. See *Oxford City*, by Boase, in "Historic Towns" series; *Oxford*, by Lang.

Ox'ford, Univer'sity of, one of the two great seats of learning in England, situated at Oxford, is a collection of colleges under one corporation known as "the chancellor, masters, and scholars of the university of Oxford." There are twenty-one colleges and two halls, to some one of which all members of the university belong. The teaching staff numbers 94 professors, with 3,500 students. Each college is a distinct institution with its own rules. The head of the university is the chancellor, who is usually chosen from the nobility, and holds office for life, and receives no salary. The vice-chancellor, appointed by the chancellor, serves four years, and is the real head of the university. There are four governing bodies, called house of convocation, ancient house of congregation, and modern house of congregation, and the council. These different bodies are made up of college officers, professors, masters of art, and resident graduates. The real management is in the hands of the council, consisting of the vice-chancellor, two proctors, who are the police officers of the university, six heads of houses, six professors, and six graduates. The teaching in the colleges of the university is carried on by professors, lecturers, and tutors. The professors do very little teaching, giving lectures perhaps twice a week, and devoting their time largely to independent study. The college lecturers are the real teachers, but belong to the separate colleges, though their lectures are now open to the whole university. A large part of the work of the college course consists in taking papers, essays, and translations to the tutors, who may be employed by individuals or by small classes.

Oxford, beginning in the early part of the 12th century, grew rapidly, its scholars were numbered by thousands as early as the 13th century. The four great orders of mendicant friars were attracted to Oxford, and established their schools in their convents, and were followed by other orders of monks. The Reformation, with the breaking up of the monasteries, destroyed half the glory of Oxford. The earliest college is Merton college, founded in 1264, and transferred to Oxford in 1274, and was the first institution organized into a college at Oxford, the earlier teachings having been carried on in halls. The old quadrangle and the library of Merton college are among the most ancient college buildings in Oxford. Baliol college, founded by the mother of John Baliol, king of Scotland, in 1268; Oriel college, founded in 1326 by King Edward II.; Queen's college, in 1340; All Souls' college in 1347; and Jesus college, founded in 1571 by Queen Elizabeth, are among the older colleges. Christ Church is the cathedral of the diocese of Oxford and also a college. The cathedral was instituted by Henry VIII., in 1546, and the college founded by Wolsey in 1525. The entrance tower contains "Great Tom," one of the largest bells in England. The buildings of Magdalen (*mâd'lin*) college, founded in 1457, are thought to be the finest college buildings in the world, and the musical services in its chapel have been famous for centuries. Other buildings connected with the university are the Bodleian library, founded in 1602 by Thomas Bodley, and now one of the largest libraries in the world; Radcliffe library, and the Ashmolean museum, the earliest public museum in England, containing British antiquities and some from Cyprus, Egypt, etc.; the Sheldonian theatre, built in 1669, for holding the ceremonies of the university; St. Mary's church, where are preached the university sermons, and the university observatory. The parks are the scene of most of the football games, and for a quarter of a mile along the river are moored the barges of the boat clubs. See *Tom Brown at Oxford*, by Hughes; *Colleges of Oxford*, by Clark.

Ox'ford, a town in Ohio, 40 miles northwest of Cincinnati. It overlooks the beautiful Miami valley and has some manufactories of agricultural implements, but is best known as a college town. It is the seat of Miami university, founded in 1809, and noted for the high positions attained by its graduates. The Western Female seminary, a school modeled after Mt. Holyoke seminary, and the Oxford institute, also a college for women, are situated here. Population 2,009.

Ox'ford, a town in Mississippi, 30 miles south of Holly Springs, is the seat of the University of Mississippi, founded in 1844, with five buildings and 640 acres of land. The Oxford academy, Oxford institute, and Union Female college are all situated here. Population 1,825.

Ox'us, the ancient name of a river in central Asia, now known as "Jihun," or "Gihon," and "Amu Daria." It rises in the tablelands of Central Asia, flows through Bokhara and Khiva, and empties into the sea of Aral. The delta of the Oxus is 90 miles long, including many lakes and marshes. The river is used for irrigation mainly, though it has been ascended for 280 miles by steamboats. It is thought to have once flowed into the Caspian sea, and to have twice changed its course since about 600 A. D. Its length is about 1,400 miles.

Ox'ygen, the most abundant and the most widely-distributed of all the elements, is a gas without color, odor, or taste. In its free state (mixed, not combined, with nitrogen), it composes about one-fifth of the air, and combined with hydrogen, it makes about eight-ninths of all the water on the globe. Nearly half of the earth's crust is oxygen in combination. It combines with all other elementary substances except flourine, argon, and several very rare gases resembling argon. It is necessary to animal life, and was called by early chemists "vital air." It was discovered at almost the same time, in the year 1774, by Priestley and Scheele. Lavoisier made many ingenious experiments to prove that the combustion or burning of bodies in the air was only their combination with oxygen. Combustible substances burn much more vigorously in pure oxygen than in air. Oxygen is continually given off by the leaves of plants in sunlight, and this is evidently the source of the atmospheric supply, for the gas is continually consumed by the breathing of animals, combustion, and decay.

Oys'ter, a common bivalve shelled mollusk, extensively used as food. It is related to the clam and mussel, belonging to that group of mollusks with plate-like gills (*Lamelli branchiata*). The two valves of the shell in the clam and mussel are similar; but in the oyster, one side (the lower one) is much larger. In clams and mussels the shell is closed by a pair of muscles, located at either end of the shell, but in the oyster, there is a single muscle located near the center of the shell. The dark violet spot on the inside of an oyster shell marks the position of that muscle. In structure and habits the oysters are much like the clams. The water is strained through the gills and the minute food particles are thus separated. They are carried forward to the mouth by the action of cilia. The digestive and circulatory systems are fairly well developed. The nervous system consists of three chief clusters of nerve-cells with connectives and nerve fibers. Oysters were formerly distributed along the western Atlantic coast, from the gulf of St. Lawrence to the gulf of Mexico, but are now rare north of Cape Cod. The Chesapeake bay is the center of the oyster beds. There are two kinds—a rounded form, found north, and a more southern elongated form. They are found also on the coasts of England, Europe, Japan, Cape of Good Hope, and Australia. The oyster fisheries are very extensive, and the animals are protected by laws. From May to September they are not caught, as that covers the period of breeding. The United States leads the world in the production of oysters, and by far the largest supply comes from the coast of Maryland. In 1894, more than 29,000,000 bushels were taken on the coast of the United States, valued at more than $16,500,000. Oysters were used as food by the ancient Romans, and it is claimed that the Japanese engaged in oyster culture eighteen centuries before Christ. See Brook's *The Oyster* (1891).

Ozark' Mountains, a range of mountains in Missouri. They start from the Missouri river, and crossing a part of Missouri and Arkansas, enter the Indian Territory. The Black Hills and the Washita mountains of Arkansas are parts of the range. The highest peaks have an elevation of from 1,500 to 2,000 feet.

Ozone' is the active form of oxygen which is produced by the action of electricity upon ordinary oxygen and in other ways. It is not possible to convert oxygen gas entirely into this form, but by cooling a mixture of oxygen and ozone to a low temperature the ozone may be condensed to a deep blue liquid which is unstable and readily explodes. When mixed with air, as ordinarily obtained, ozone possesses a powerful odor resembling that of diluted chlorine, and it is the most powerful oxidizing agent known, attacking india-rubber, paper, and other organic substances, and corroding mercury at ordinary temperatures. It is unstable and gradually changes to ordinary oxygen upon standing, while it undergoes this change instantly upon heating. It has been shown that ozone gas is one and one-half times as heavy as oxygen, hence chemists believe that the particles or molecules of this gas are made of three oxygen atoms, while ordinary oxygen molecules are made of two atoms. Very minute quantities of ozone probably exist in pure air, particularly that coming from the sea. The popular notion that this ozone is beneficial to health is not based on any certain facts. H. L. WELLS.

P

Pacif'ic Ocean or **South Sea** is the largest of the divisions of the ocean, including about one-half of the water surface of the globe, and covering more than one-third of the whole earth. It is 9,000 miles long, and its greatest breadth is 10,000 miles, with an area of 76,000,000 square miles. It is deeper than the Atlantic, averaging about 2,130 fathoms. There are two trade winds, blowing almost constantly, one from the northeast and the other from the southeast, on which the surface currents of the ocean depend. Along the equator is a region of calms, and also north and south of the trade winds there are belts of calms. A cold current from the Antarctic ocean flows along the coasts of South America, and a warm current from the equator flows west, dividing into two branches; one known as the Japan or north equatorial current flows north past Alaska, resembling in its effects the Gulf stream in the Atlantic; the other turns south and flows along the shores of Australia and New Zealand.

The largest American river flowing into the Pacific is the Yukon, 2,000 miles long, emptying into Bering sea; besides this are the Fraser, Columbia, Sacramento, and Colorado rivers. The rivers of South America flowing into this ocean are only mountain streams, as the Andes mountains approach so closely to the coast. The rivers of Asia, however, that flow into the Pacific are among the largest in the world, including the Amur, Hoang-ho, Yang-tse-Kiang, Mekhong, and Menam. The coasts of America and Australia bordering on the Pacific are generally mountainous, though the shores of Alaska are low and swampy, and the southern part of South America is broken with bays and islands. The gulfs of California, Panama, and Guayaquil are the most important on the American coast. The coasts of Asia are low and fertile, with many gulfs and bays and groups of islands. Bering sea, Sea of Okhotsk, Sea of Japan, Yellow sea, and China sea are formed by the peninsulas and islands on the Asiatic coast.

The Pacific ocean is remarkable for its numerous small islands and groups of islands. On the American coast are Vancouver's, Queen Charlotte, Prince of Wales, and others, in British America; Terra del Fuego, and the islands on the coast of Chile, and the Aleutian islands; the islands of Japan, Formosa, Philippine islands, Borneo, Celebes, Sumatra, and Java, New Guinea, Australia, and New Zealand are Asiatic islands, while in mid-ocean are many groups of volcanic origin. The Sandwich (Hawaiian) islands, the Ladrone islands, Marshall islands, Gilbert islands, in the North Pacific, and the New Hebrides, Society islands, Fiji islands, and the Friendly (or Tonga) islands are the principal of these island groups.

The Pacific ocean was first seen by Europeans from a mountain in Panama, by Balboa, a Spaniard. Magellan, making his way through the strait of Magellan, was the first European to sail on it, in 1520. He named it Pacific, because of its quiet waters. The first English navigator that explored it for any distance was Sir Francis Drake. The northwest passage through the Arctic ocean into the Pacific was discovered by Sir Robert McClure in 1850, and the northeast passage, in 1874, by Nordenskjold.

Pack'ard, Alpheus Spring, an American naturalist, was born at Brunswick, Me., Feb. 19, 1839, graduated from Bowdoin in 1861, and became assistant to Agassiz at Cambridge. After taking part in several scientific expeditions, he became state entomologist of Massachusetts and professor of zoölogy and geology at Brown university. He is widely known as an entomologist and zoölogist. Besides many technical papers, his publications include, *Guide to the Study of Insects* (1869), *Our Common Insects* (1873), *Zoology* (1879), *Entomology for Beginners* (1888), *Text-Book of Entomology* (1898).

Paderewski (*pad-e-rŏ'ski*), **Ignace Jan,** a Polish pianist, was born in Podolia, a province of Russian Poland, in 1860. He began his musical studies when six years old, but with very imperfect teachers, and at the age of twelve went to the conservatory at Warsaw. He made his first musical tour through Russia at sixteen, and was made a professor of music in the conservatory. Subsequently, he gave himself still more devotedly to his art, studying at Berlin and Vienna, and was appointed a professor in the conservatory at Strasburg, in 1883. While here, visiting a summer resort, to amuse his friends he once extemporized upon a theme in the style of every great musical composer, sitting down to the piano in the evening, and playing until five in the morning. He made his first public appearance as a musician at Vienna in 1887, his wonderful reputation as a performer on the piano having been made since that time. He does not depend upon his genius, great as it is, but on practice and study, shutting himself up before a concert and practicing all night. He is particularly happy in his interpretations of the works of Rubenstein, Chopin, Liszt, and Schumann. His musical compositions were nearly all written before he was five and twenty; *Polish Dances*, *Song of the Voyager*, *Menuet*, and others are among those most valued.

Padilla (*pă-dēl'yă*), **Juan Lopez de,** a popular hero of Spanish history, was appointed military commandant of Saragossa by Charles V. Soon thereafter the great rebellion, on account of burdensome taxation,

broke out, and Padilla was called to the head of the movement by the people. He was fortunate in many movements, but on April 23, 1521, he was defeated at Villalar, taken prisoner, and beheaded. His wife gathered the remaining army and held Toledo for a long time, and upon its fall retired to Portugal.

Padua (*pad'ū-ä*), one of the oldest cities of Italy, was, in the 5th century, ruled by the Huns, then exchanged between the Goths and the Eastern empire, and from 1318 to 1405 was ruled independently by a lord. In the latter year, it was conquered by Venice, which held it until 1797, when it was given to Austria, which, except from 1805 to 1814, ruled it until incorporated into Italy in 1866. The old streets are dark and narrow, and a wall still surrounds the town. The most notable building is the municipal palace (1172–1219), whose roof, 267½ feet by 89, is the largest in Europe unsupported by pillars. It has also many old churches. The university, which dates from 1222, and has 71 teachers and 1,588 students, has long been celebrated. There is no manufacturing industry. Population 83,748.

Padu'cah, the county seat of McCracken county, Ky., stands on the Ohio river about 48 miles above its mouth, and enjoys a large river and rail trade. It has flour, saw and planing mills, foundries and manufactories of soap, ice, furniture, vinegar, and tobacco. Population 19,446.

Paganini (*pä-gä-nē'nē*), **Nicolo,** a famous Italian violinist, was a porter's son, born at Genoa, Feb. 18, 1782. He early devoted himself to his instrument, practicing sometimes ten hours at a stretch, and in 1793 gave his first concert. His professional tours began in Italy in 1805, extended through Germany and Austria in 1828 and 1829, and Paris and London in 1831. He reurned to Italy very wealthy and died at Nice, his violin in his hand, May 27, 1840. See Grove's *Dictionary of Music*, Vol. II., and Engle's *From Mozart to Mario.*

Page, Thomas Nelson, famous as a writer of stories and poems in the negro dialect, was born in Hanover county, Va., April 23, 1853. He studied at Washington and Lee university, and practiced law at Richmond. He wrote his first story, *Marse Chan*, in 1884, and a collection of his writings is published under the title, *In Ole Virginny. Meh Lady* and *Marse Chan*, are two of his most popular books.

Page, William, an American painter, was born at Albany, N. Y., Jan. 23, 1811. His genius for art showed itself at an early age, and overcame his efforts to study law and theology. He received a premium from the American institute in New York for a drawing in India ink, when eleven years old, and a medal from the National academy before he was seventeen. His first portraits were those of Governor Marcy for the New York city hall, and of John Quincy Adams for Faneuil hall at Boston. In 1849, he went to Italy, spending ten years at Florence and at Rome. Besides executing, while there, such works as *Moses and Aaron on Mount Horeb* and the *Flight into Egypt*, he made copies of Titian's paintings, one of which was prevented from leaving Florence by the public officers, who insisted that it was the original picture. His full-length portrait of Farragut at the battle of Mobile was presented by a committee, in 1871, to the emperor of Russia. His portrait of Christ, and his bust of Shakespeare, and the portraits from the bust, are among his later works. He died on Staten island, New York, Oct. 1, 1885.

Pag'et, Sir **James** (Baronet), a distinguished English surgeon, was born at Yarmouth, England, in 1814; and died at London, Dec. 30, 1899. He entered the Royal College of Surgeons in 1836, became an honorable fellow in 1843, member of the council in 1865, president in 1875, and Bradshawe lecturer in 1882. He was surgeon to Queen Victoria, and to the then prince of Wales, and consulting surgeon to St. Bartholomew's hospital. He was made a baronet in 1871, and also an LL.D. by the university of Edinburgh. His works are, *Lectures on Surgical Pathology*, and *Clinical Lectures.*

Paine, Robert Treat, an American statesman, was born at Boston, March 11, 1731. He was a graduate of Harvard, and a student of theology and law. He was chaplain in 1755 of the provincial army on the northern border, and became prominent in the contests preceding the Revolution, being a delegate of the convention called in 1768 at Boston, and in 1770 managed the prosecution of Captain Preston for firing on the people. He was a member of the general assembly of Massachusetts in 1773 and 1774, and of the Continental congress from 1774 to 1778, and also a signer of the declaration of independence. He was judge of the supreme court of Massachusetts and attorney-general of that state for ten years. He died at Boston, May 11, 1814.

Paine, Thomas, a writer and free-thinker, was born in Norfolk, England, Jan. 29, 1737, and became in turn a staymaker, marine, schoolmaster, exciseman, and tobacconist. In 1774, he sailed for America. In 1776, his pamphlet *Common Sense* appeared, followed a year later by *The Crisis.* While he was serving as a private at Trenton, congress gave him the position of secretary of the committee of foreign affairs, but he lost the post in 1779, and was appointed clerk of the Pennsylvania legislature, and in 1785 was given $3,000 and the New Rochelle farm by congress. He returned to England in 1787, and in 1791–92 published his *Rights of Man*, and the famous reply to Burke's *Reflections upon*

the French Revolution. This work caused much trouble and he fled to Paris, where he was elected to the national convention which tried Louis XVI. Favoring the king, he offended Robespierre, and was imprisoned for a period of eleven months. Before his arrest, he had written Part One of *The Age of Reason*, and Parts Two and Three appeared in 1795 and 1807. In this he decried atheism and Christianity and advocated deism. He returned to America in 1802, became a drunkard, and died at New York, June 8, 1809. See Leslie Stephen's *History of English Thought in the 18th Century.*

Pais'ley, a city in Renfrewshire, Scotland, is situate on the White Cart, three miles above the Clyde and six from Glasgow. It was first heard of in 1157, was burned by the English in 1307, and suffered in the reformation in 1561. It was made a free burgh in 1488. The chief public edifices are the municipal buildings, courthouse, the county buildings, and library and museum. The manufacture of "Paisley shawls" has become extinct, but the works of cotton thread, dyeing, bleaching, tartans, woolen shawls, chemicals, starch, corn flour, carpets, and distilling and brewing flourish. Population 78,258.

Palachy (*pä-läts'kē*), **Frantisek,** a Bohemian historian, was born in Moravia, on June 14, 1798, and studied at Presburg and Vienna. He was appointed Bohemian historian in 1829, and directed to write the *History of the Bohemian People to 1526*, which is one of the greatest Bohemian literary works. He took part in the political agitation of 1848, wrote a work on the Hussite period, and died at Prague, May 26, 1876.

Palatinate (*pa-lat'in-āt*), the name of two German states united before 1623. They were called the Upper and Lower Palatinate, the Upper being what is now the kingdom of Bavaria, and the Lower lying on both sides of the Rhine, and bounded by Mainz, Treves, Lorraine, Alsace, Baden, and Würtemberg. The capital was Heidelberg. The Rhenish Palatinate was established as an hereditary possession as early as the 11th century, and in 1216 it was granted to the duke of Bavaria, and this and the Bavarian territory were held by the Bavarian house. In 1559, the Rhenish territory and the electoral vote passed to Frederick III.; afterward it passed to Frederick V., and finally to his son. In 1801, France took possession of the western part and gave the eastern to Bavaria, Nassau, and Hesse-Darmstadt. The left bank was restored to Germany in 1815, the larger part going to Bavaria, the rest being divided among other provinces. To-day, two districts of Bavaria are known as the Palatinate proper (Rheinpfalz), with an area of 2,288 square miles (population 765,991), and Upper Palatinate (Oberpfalz), with an area of 3,728 square miles (population 546,402). The capital of the latter is Ratisbon, on the Danube, population 41,471.

Pal'atine Hill. See ROME.

Paleobot'any, the science which deals with fossil plants. It is the correlative of paleontology, which deals with fossil animals. It is the function of paleobotany to work out the history of plant life on the earth. This involves the determination, as far as possible, of plants which have lived in successive ages, and the relations of those of one age to those of previous and succeeding ages. The science is as yet but poorly developed.

Paleontol'ogy, the science which deals with fossils. Vertebrate paleontology deals with the fossils of vertebrates; invertebrate paleontology, with the fossils of invertebrates; paleobotany, with the fossils of plants. All systems of rocks younger than the Archean contain fossils. Roughly speaking, they are more abundant in the later systems than in the earlier, and but few have been found in the Algonkian. The animal and plant fossils of a given system of rocks represent the fauna and flora, respectively, of the period when the system was formed. It is customary to speak of the fossils themselves as the fauna and flora; the Cambrian fauna consists of the fossils of the Cambrian system; the Lower Cambrian fauna of the fossils of the lower division of the Cambrian system; the Middle Cambrian fauna of the fossils of the middle division of the Cambrian system; and so on. It is the province of paleontology to determine (1) what fossil forms occur in the rocks of each system and in the rocks of each part of each system; (2) to determine the origin of each fauna; and (3) the relations of each fauna to its successor. The first point mentioned above involves a knowledge of the geographic diversity of animals at each stage of the earth's history. For example, there have been times when faunas were essentially cosmopolitan, that is, when the same species were essentially worldwide in their distribution. There have been other times when the faunas were colonial, that is, when geographic diversity was very great. These facts and their explanation belong to paleontology. Paleontology also involves the study of the fossils in the earlier and later parts of a system. The second point mentioned above involves the determination of the question as to whether the fauna of a given system or part of a system originated from the fauna which lived in the same region at an earlier time; or whether it represents immigrants into the region where it occurs; or, lastly, whether it resulted from the commingling of resident forms with immigrants. The third point mentioned above is akin to the second. It considers a fauna in connection with its successors and descendants, instead of in connection with its predecessors and ancestors. A complete knowledge of paleontology would

involve a complete knowledge of the living forms of each stage of the earth's history. It would do for all forms of life what history essays to do for the human race.

Paleontology is of great service in determining, or helping to determine, the age of rock formations, when their age could not be determined by other means. After the study of fossils has progressed so far as to make known the faunas of successive periods, the finding of the fossils of any one of these faunas in a given bed of rock determines the age of the bed. In making such determinations the general character of the fauna as a whole, rather than any single species, is to be relied on. Those phases of paleontology which involve the study of fossils for determining the age of formations, or for determining the relations of land and water at successive periods, or for the determination of geologic conditions of any sort are sometimes called *paleontologic geology*. Paleontologic geology, therefore, involves the study of fossils for the light they may throw on earth history. Paleontology also affords one of the chief lines of investigation for the solution of many of the problems of biological evolution. Those phases of paleontology which involve the study of fossils for the light they may throw on the history of the animal life of earth are *paleontologic zoology*. The term *paleontologic botany* would have a corresponding meaning in connection with plant life.

In a general way it is true that the animals and plants of any period are, on the whole, of higher types than those of preceding periods; but, while this is true as a general statement, it does not follow that the representatives of any class of animals in any given period are of higher type than any of the representatives of the same class at an earlier time. For example, trilobites became extinct at the end of the Paleozoic era. (See GEOLOGY.) The last of the trilobites were not higher in type than earlier representatives of the same group. The living representatives of some types of animals are less highly organized than ancient representatives of the same type. Paleontology seems to show that evolution is primarily *differentiation*, not *ascent*. Differentiation, in this connection, means the derivation of various types from a single type. Some of these derivative forms may be higher than the ancestral form, while others are lower. In the struggle for existence, the higher types, on the whole, seem to have got the better of the lower, not to the extent of annihilating the latter, but to the extent of allowing the former to dominate them. While the succession of fossils supports, in a general way, the doctrine of evolution, it has, in few cases, afforded the specific forms which demonstrate a connected line of ancestry between living forms and very ancient ones.

It is probably true that many forms of life which have lived in the past were never fossilized. It is probably true that very many forms which have been fossilized have not been found. Most fossils which are now known are the fossils of species which lived in shallow water, or in marshes and lakes. Relics of those forms of life which lived on dry land are rarely preserved. The relics of animals which live in the deep sea are likely to be preserved, but have rarely become accessible, for the fossiliferous formations of the land were, for the most part, made in shallow water. Present knowledge of ancient life is, therefore, very far from complete, and must always remain so. R. D. SALISBURY.

Palermo (*pa-ler'mō*), a seaport, archbishopric, former capital of Sicily, now the fifth city of Italy, stands on the northwest corner of the island in a valley before Mount Pellegrino. The city was first known as the Phœnician Panormus. It was successively conquered by Pyrrhus (276 B. C.), by the Romans (254 B. C.), by the Vandals (440 A. D.), by Belisarius, the Saracens, the Pisans, and the Normans. In the earthquakes of 1693, 1726, and 1823, the city suffered much. It revolted against the kings of Naples in 1820 and 1848, and was freed by Garibaldi in 1860. The streets are lined with old and picturesque buildings, of interesting architecture, the most conspicuous being the Cathedral of St. Rosalie, the royal palace, the churches of Martorana, St. John of the Hermits, and San Cataldo, the archbishop's palace, town house, and arsenal. A state university founded in 1805, has its seat at Palermo, with a teaching faculty of 61, and 1,222 attending students. The industries are insignificant, but the shipping of oranges, lemons, dried fruits, sumac, tartar, grain, oils, manna, sulphur, wine, and lemon juice are very large. Population 292,799. See Freeman's *History of Sicily*.

Pal'estine, the land of Canaan, the land of promise, the Holy Land, and the land of Israel of the Bible, was at the time of the conquest inhabited by six nations: the Canaanites, Hivites, Hittites, Ammonites, Perizzites, and Jebusites. The invaders settled in allotted lands, and the struggles for possession followed for some years, although no tribes were dispossessed. In early times the tribal distinctions were strongly preserved, but later, as spoken of in the book of Judges, the cities rose and fell, and Jerusalem became the capital of David and Solomon; but on the founding of the northern kingdom Shechem, Tirzah, and Samaria became in succession the capital. On the return of the Jews from captivity, they inhabited the territory between Jerusalem and Beersheba, and Jericho and Læchish, while the Philistines retained their lands undisturbed. Under Herod the Great, who governed the entire country, the kingdom included Galilee, unknown in the Old Testament, Samaria, Judæa, Idumæa, Peræa, Gaulonitis, Auranitis, and Trachonitis. The most populous and fertile of these provinces was Galilee. The prosperity fostered by the

Roman rulers disappeared on the conquest by Vespasian and the destruction of the temple by Titus. The second time the Jews rose in revolt, led by Bar-Cochba, the pretended Messiah, led to the bloodiest of all wars, including the siege of Jerusalem, but the revolt was put down before the fortress of Bether.

For the next hundred years the progress of Christianity was rapid, and after the conversion of Constantine and the building of the Church of the Holy Sepulchre, the history for three hundred years is the story of the church. In 614 A. D., King Chosroes, of Persia, entered Syria and was joined by the Jews, who looked to him for deliverance. They massacred 90,000 Christians in Jerusalem and burned all the buildings. Fifteen years later, the country was retaken by Heraclius, only to have it fall into the hands of the Mohammedans, in whose control it remained for four hundred years. About 640, the Mosque of Omar, the most beautiful building in the world, was built by Byzantine architects. The crusades failed to relieve the oppression, and the country went from bad to worse as regards progress, and the ruins crumbled further.

Palestine covers an area of about 6,000 square miles, is bounded on the north by the river Kasimiyeh, on the east by the Jordan, and on the west by the sea. Ranges of hills run over the entire country from east to west and, as the Bible says, it consists of desert, hills, plains, and valley. The principal elevations are Jebel Jermûk, 3,934 feet; Mounts Carmel, Ebal, Gerizim, Tell Asûr, and Râsesh Sherifeh. The valley of the Jordan begins near the Mediterranean and runs from 5 to 13 miles wide to the plain of Jericho. The country has few rivers, the Mefshukh, Namien, El Mukatta, and a few others flow into the Mediterranean, and the Yarmuk, Rukkad, Zerka, and Mojib, flow into the sea of Galilee. The summers are extremely warm and the winters cold and wet. At present, the modern spirit of improvement is at work in Palestine, roads are being built, railroads run from Jaffa to Jerusalem, and new colonies with new buildings are scattered over the entire land. The ruins are disappearing, and a modern country is springing up from the ashes. See E. Hull's, *Physical Geology and Geography of Arabia Petræa, Palestine*, etc.

Palestrina (*pă-lĕs-trē'nă*), **Giovanni Pierluigi da**, the greatest Italian composer, was born, in 1524, at Palestrina, studied at Rome and, in 1551, was made musical director of the Julian chapel of St. Peter's by Pope Julius III. In 1554, he published a collection of masses and became one of the singers of the Sistine chapel, which position he lost upon the accession of Paul IV., but in 1555 became choir master of the Lateran, and in 1561 was given a similar position in St. Maria Maggiore, which he held to the year 1571, when he returned to the Julian chapel. He reconstructed the musical service of the church, combining musical science with art, and takes a front rank in musical history. All his numerous compositions are sacred music. He died at Rome Feb. 2, 1594. See *Life*, by Baini.

Pal'et (in plants), the prominent bracts associated with the inflorescence of grasses are called "glumes," and those immediately about the individual flowers are called palets. See GRASS.

Pal'impsest, the name given to ancient parchments which have been used more than once for writing purposes. The conquest of Egypt by the Saracens cut off from Europe the papyrus which was used to write upon, and parchment could be had only in limited quantities. So, through the dark ages, old manuscripts were used, after removing the first writing upon them. Sometimes the writing was washed off with a sponge, and the parchment smoothed with pumice stone; at other times the letters were scraped away with a sharp blade. Nearly all ancient manuscripts, however, were written with an ink which could not be entirely removed, and traces of a former writing could be seen beneath the new copy. In modern times, there have been various efforts to restore these ancient writings by some chemical treatment. In this way have been found copies of the *Republic* of Cicero, the *Institutes* of Gaius, a part of the Epistle to the Romans, and other parts of the Old and New Testaments. The *Republic* of Cicero was covered by a commentary on the Psalms, written by St. Augustine.

Pal'las. See MINERVA.

Palissy (*pă-lē-sē'*), **Bernard,** the great French potter, was born near Agen, in 1509, and wandered as a glass and portrait painter until he married and settled in Saintes in 1538. While working here as a surveyor, his attention was attracted by an enameled cup, and he determined to discover the process, and, after sixteen years of continuous labor and experiment, in which he used all his resources and burned the tables and floors for fuel, he succeeded, and though imprisoned in 1562 as a Huguenot, he was released by royal edict and appointed "inventor of figulines" to the king. He removed to Paris in 1564, and, through the aid of Catherine de Medici, was saved from the massacre of St. Bartholomew. From 1575 to 1584, he gave a course of lectures on physics and natural history, demonstrating the origin of springs, the formation of fossil shells, and the best method of purifying water. In 1585, however, he was again arrested as a Huguenot and imprisoned in the Bastille, where he died in 1589. See H. Morley's *Pallissy the Potter*.

Palm, species of the great tropical family *Palmaceæ*. Palms are the tree monocotyledons, and there are more than 1,000 species. The palmetto of the Gulf states is a diminutive representative of the group. The body consists of a tall, unbranched, columnar trunk bearing at its summit a crown of immense leaves, which are pinnately or palmately veined, and often splitting so as to appear lobed or compound. The flower clusters arise from the leafy crown and are usually very large and pendent. Aside from their ornamental purposes, the palms are very useful. Notable among the useful forms, are the date palm with its pulpy fruit, the cocoanut palm with its huge seeds full of edible endosperm, the sago palm whose pith yields the starchy sago, the ivory palm whose hard endosperm is the vegetable ivory, etc. Palm honey, palm-wine, and palm-oil are also well known products. The leaves of many of the species are used for making hats, baskets, fans, etc. The palm of history and of the Bible is the date palm, while the most prized ornamental species is the royal palm.

PALMYRA PALM.

Palm'er, Edward Henry, an English orientalist, was born at Cambridge, Aug. 7, 1840, and while a boy learned the gypsy language. Afterward he acquired Italian and French. In 1860, he began the study of the Orient at Cambridge, and in 1867 graduated with third-class honors in classics. In 1868–1870, he was working for the Palestine exploration fund in surveying Sinai, and in 1871 became professor of Arabic in Cambridge, and published *The Desert of the Exodus*. In 1882, he was sent by the government to win the Sinai tribes over to Britain, and prevent the destruction of the Suez canal by Arabs, and made two expeditions, on the second of which, from Suez with Captain Gill and Lieutenant Charrington, he was betrayed and murdered at Wady Sudr, near Suez, Aug. 11, 1882. His remains, and those of his companions now repose in St. Paul's, London. See his *Life*, by Sir Walter Besant.

Palm'er, Erastus Dow, an American sculptor, was born at Pompey, N. Y., April 2, 1817. He was a joiner by trade, and made carvings first of animals and leaves in wood. Seeing a cameo head, he cut on a shell a portrait of his wife, and his success induced him to try working in marble. Two bas-reliefs, *Morning* and *Evening*, *The Sleeping Peri*, *The Angel at the Sepulchre*, in the cemetery at Albany; *Immortality*, *Faith*, and *Sappho*, also bas-reliefs, are some of his best-known works. He has executed busts of Alexander Hamilton, Washington Irving, Commodore Perry, and others, and a statue of Robert Livingstone, for the state of New York, cast in bronze. *The Landing of the Pilgrims*, in the capitol at Washington, is one of his largest works.

Palm'er, John M., a soldier and statesman of Illinois, was born at Eagle Creek, Ky., Sept. 13, 1817. He removed to Illinois when fourteen years of age and made his home at Carlinville in that state. He was admitted to the bar in 1839, and from the first took an active part in politics. He was a state senator in 1852–55, and was prominent in the organization of the Republican party in 1856. He was a member of the peace convention at Washington, Feb. 4, 1861, when it was hoped to avert war between the Federal government and the seceding states. At the outbreak of the war, he was given command of the 11th Ill., and he took part in General Fremont's Springfield expedition. He became brigadier-general in the same year, and major-general in 1862. He took part in the battles of New Madrid, Island No. 10, Corinth, and Murfreesboro. In Sherman's campaign in 1864 General Palmer had command of the 14th corps. In 1866, he had command of the military department of Kentucky. In 1868, he was elected governor of Illinois by the Republican party and served two terms. He took part in the movement to elect Horace Greeley to the presidency, and afterward acted with the Democrats. He was United States senator in 1891–97. In 1896, he was the candidate for the presidency upon the ticket of the "sound money" Democrats. He died Sept. 25, 1900.

Palm'er, Ray, an American clergyman, was born at Little Compton, R. I., Nov. 12, 1808. He graduated at Yale college, and studied theology, entering upon his pastoral work at Bath, Me. Most of his life was spent at Albany, N. Y., where he was one of the most prominent clergymen of the Congregational church. He is best known by his hymns, some of which are found in nearly every church collection, and one of which, *My Faith Looks Up to Thee*, is widely used and very popular. Besides many hymns, he has written *Closet Hours; Remember Me, or the Holy Communion; Home, or the Unlost Paradise*, a poem; and *Earnest Words*. He died at Newark, N. J., March 29, 1887.

Pal'merston, Henry John Temple, Viscount, was born near Romsey, Hants, in England, on Oct. 20, 1784, and went to the University of Edinburgh in 1800, succeeded his father as viscount in 1802, and graduated

from Cambridge in 1803. Of great ability, he was the candidate of the Tories from the college in 1806; he was defeated then and in 1807, but gained a seat in parliament in that year from the Isle of Wight. In 1811, he was elected from Cambridge and held his seat for twenty years, until he supported the reform bill. Then he successively represented Bletchingly, South Hampshire, and Tiverton. In 1809, as a tory, he was made junior lord of the admiralty and secretary of war, without a seat in the cabinet, and held the office until 1828. He left the Tory party in 1828 and entered the reform ranks, and under Earl Grey in 1830 became minister of foreign affairs, and as such adopted a policy which made England and France friends. He assisted in securing the independence of Belgium and in placing the thrones of Spain and Portugal on a constitutional basis. In 1841, he went out of office with the whigs, but returned in 1846 as foreign minister and stirred up various difficulties through his policy. In 1850, a resolution of censure was introduced in the house of lords and a resolution of confidence in the lower house, and after a debate of four days the latter was carried. In December, 1851, Palmerston was asked to resign on account of the expression of his opinions regarding the actions of Louis Napoleon, but defeated the prime minister, Lord Russell, on the militia bill in the following February. He became home secretary in 1852 and in 1855 was made prime minister, and although his government was defeated in 1857, on an appeal to the country, it stood until February, 1858, when it fell before the conspiracy bill. In June, 1859, Palmerston was made first lord of the treasury, which post he retained until his death. Among the principal events of his official career, were the American Civil war, Napoleon's war with Austria, and the Austro-Prussian war with Denmark. He died at his country seat, near Hatfield, Hertfordshire, Oct. 18, 1865. His prevailing characteristics were oblivion of self and the ardent desire to be the head of a people, not of a political party, and intense patriotism. See *Lives*, by Anthony Trollope, and the Marquis of Lorne, now Duke of Argyle.

Palmyra (*pal-mī'rä*), from 100 to 1300 A. D., a rich and beautiful city of Syria, stands in an oasis on the northern line of the Arabian desert, about 150 miles from Damascus on one side and the Euphrates on the other. It was supposed to have been founded by Solomon, but probably was a caravan station of the Arabs. During the wars between Rome and Parthia, the city acknowledged Roman supremacy and gained much by it, inasmuch as it was made the object of many favors by the Roman emperors. In 272, the attempt to found an independent empire was crushed by Aurelian, and it remained a Roman dependency until it submitted, with the rest of Syria, to the Moslems. It began its retrograde career in the 15th century, and now is but a city of ruins. The ancient inhabitants tanned leather, controlled the desert caravan trade, and mined salt, gold, and silver. See *Ruins of Palmyra*, by Wood and Dawkins.

Palo Alto (*pă'lō ăl'tō*), **Battle of,** an engagement between American troops under General Taylor, and the Mexicans led by General Arista. It took place (May 8, 1846) in the woods in the southern part of Texas, about eight miles northeast of Brownsville. The battle lasted five hours, and the Americans were victorious. Palo Alto is from the Spanish, meaning "tall timber."

Pa'lo Al'to, a town of Santa Clara county, in California, 30 miles from San Francisco, is the seat of a university founded by Leland Stanford in memory of his son. It is intended to provide education entirely free, from the kindergarten stage to the highest post-graduate work, with schools of law, medicine, and music. Several of the buildings are finished in Moorish architecture of yellow sandstone. The university, which was opened in 1891, has a faculty of 130 instructors, with about 1,400 students; has already received $20,000,000 from Senator Stanford, and has an annual income of about $600,000.

Pamir (*pă-mēr'*), the center of the central Asian highland system, is a lofty plateau with an average elevation of 13,000 feet, and unites the western ends of the Himalayas and Tian Shan mountains with the Hindu-Kush. It is crossed by mountain ranges, many peaks rising to enormous heights; and although exposed to great extremes of heat and cold and to severe snow and sand storms, the Kirghiz shepherds tend their flocks there and it is often crossed by travelers. It is full of animal and bird life, and has large rivers and lakes, including Karakul, 120 square miles, and Shivakul, 100 square miles. The Pamirs are often referred to as "the roof of the world," from their high elevation.

Pamlico (*pam'lē-kō*) **Sound,** a small arm of the Atlantic ocean on the coast of North Carolina, is separated from the ocean by long, narrow islands of sand. It is very shallow, and is about 75 miles long by from 10 to 25 miles wide.

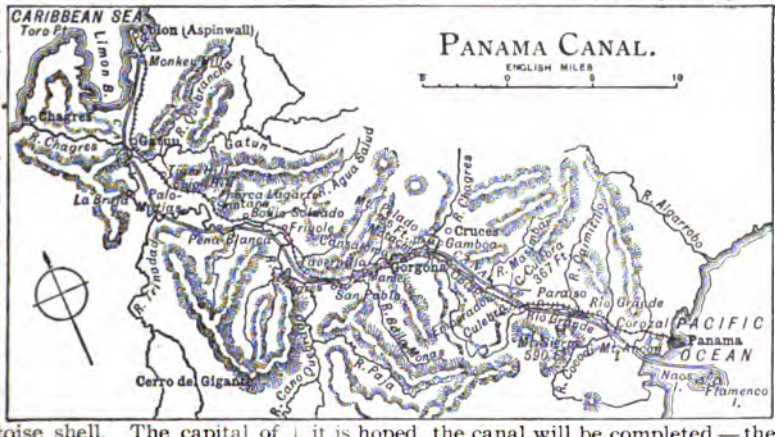
Pam'pas, a name properly applied to the large treeless plains of the Argentine Republic in South America. They rise in a series of terraces from the coast to the foot of the Cordilleras, and extend about 2,000 miles long by 500 miles broad. In the northeastern portion it is very fertile and the pampas are used almost exclusively for grazing purposes, but the rest is barren and dry, abounding in strips of desert, the soil being of sandy clay. The level districts of Peru, 180,000 square miles in extent and covered by trees, are also called pampas.

Pampas Grass, covering the pampas of the Argentine, is very hardy, beautiful in appearance, and often used for ornament. The leaves are from six to eight feet long, and the flowering stems, with large spikes of silvery-white flowers, are from ten to fourteen feet in height. The plant is now cultivated in California for the flower plumes, which are used in decorations by florists.

PAMPAS GRASS.

Pan, according to the Greek story, is considered the god of pastures, forests, and flocks and is represented as having horns, a goat's beard, a crooked nose, pointed ears, a tail, and goat's feet. The worship of Pan began in Arcadia, and in time extended all over Greece, reaching Athens last. He was worshiped by offerings of cows, goats, lambs, milk, honey, and wine. He was also supposed to have been very fond of music, being credited as the inventor of the syrinx, or pandean pipes. The Romans have identified him as their god Faunus. The story of his death, coincident with the birth of Christ, is finely treated by Milton, Rabelais, Schiller, and Mrs. Browning.

Panama (*pä-nä-mä'*), **Isthmus of,** is the narrowest part of Central America and connects Costa Rica with Colombia. It is 35 miles wide, has an area of 31,571 square miles, and now forms part of the department of Colombia. The population is 285,000. The isthmus is traversed by a range of mountains running between the Atlantic and the Pacific, and many streams, some of considerable size, notably the Tuira (160 miles), flow into both oceans. The trading ports are Aspinwall, or Colon, and Panama, and the exports are hides, tallow, indigo, caoutchouc, coffee, vanilla, gold dust, and tortoise shell. The capital of the department is Panama (population 30,000).



Panama' Canal. The plan of uniting the Atlantic and Pacific by means of a canal across the Isthmus of Darien, now Panama, was first talked of as early as 1520 and was much discussed during the 16th century. Two centuries ago definite and complete drawings were made by the Dutch, but nothing was done until Ferdinand de Lesseps called a congress of nations at Paris, in 1879, to discuss the feasibility of cutting through Panama. A concession was bought and on Feb. 28, 1881, the first force of workers landed at Colon. The canal commission estimated that the entire cost would be 800,000,000 francs, or about $160,000,000, but de Lesseps cut this down to $120,000,000 and the work proceeded. Up to 1888 immense sums of money had been borrowed and the work was not one-fifth completed, so at that year when further borrowing became impossible and the company was burdened with interest charges on the capital loaned it, owing at that time almost $370,000,000, it went into liquidation. The Colombian government granted an extension of ten years from 1893 in which to finish the work, provided that it was resumed before February, 1893. But the natural obstacles of floods, tide levels, and the death of the laborers through fevers and pestilences, on account of the climate, served to retard the work. Much of the money subscribed and borrowed, it is alleged, was foolishly spent and squandered, besides a large amount that was paid into channels that diverted it from the sources for which it was intended; so in December, 1892, a commission was appointed in France to investigate the actions of the officers and projectors of the company. As a result, certain government officers were involved in the scandal, and this led to the overthrow of the ministry. In March, 1893, a further extension of time was granted for the formation of a new company to construct the canal. According to a report (1899), this time-limit will expire in 1910. By that year, it is hoped, the canal will be completed — the cost of the revived project being put at $100,000,000. See Dr. W. Nelson's, *Five Years at Panama.*

Pan-American Exposition, a fair for the exhibit of the resources and products of the two Americas and their outlying islands, which was incorporated by the legislature of New York and endorsed by the Federal congress. According to its charter, the exhibition was held between the months of May, 1901 and Nov. of the same year, the site being Buffalo, N. Y. Congress voted $500,000 in aid of the project, and voted to loan interesting exhibits from the Smithsonian institution, the National museum, and other departments of the government. About $2,500,000 was raised in Buffalo for the purpose of equipping the exposition, and the state made a considerable appropriation. The grounds selected covered 350 acres. Power was conveyed from Niagara Falls by means of electric wires, and the exposition was successful in displaying many important electrical inventions down to date. Its main court, the Court of Fountains, was 500 feet wide by 2,000 long. The Fair was designed to embrace the main features of the Columbian Exposition which was held at Chicago, so far as they relate to the Western hemisphere. The Stadium, in which were held athletic games, seated about 10,000 persons. The president of the Exposition company was Mr. John G. Milburn, and the director-general, Mr. W. I. Buchanan, formerly minister to the Argentine Republic. A tragic incident happened early in September at the Exposition, in the attempt on the life of President McKinley, by an anarchist, named Czolgosz, which unhappily proved fatal, early on the morning of Sep. 14, 1901. In other respects the Exposition proved highly successful.

Pandora (*pan-dō'rä*), according to the Greek legend, was the first woman on earth. When Prometheus stole the fire from heaven, Zeus caused a woman to be made to bring trouble to man, and sent her to Prometheus' brother, Epimetheus. A later story relates that Pandora possessed a box in which were all the ills and troubles, which escaped on the box being opened. Still another story has it that the box contained all blessings, and Pandora, on opening it, allowed all to escape but hope.

Pan'golin, the name given to any one of the scaly ant-eaters belonging to the genus *Manis*. They are mammals, but the shape of their bodies and the presence of scales give them the appearance of reptiles. The scales are formed of cemented hairs. In some forms the tail is longer than the head and body. They inhabit Asia and western Africa and vary in length from one to five feet. They are burrowing animals and feed mainly on white ants.

Pan'icle, an open spray-like cluster of flowers, consisting of a compound raceme chiefly branching below. See INFLORESCENCE.

Pansy. See VIOLET.

Pantheon (*pan'the-on*), a temple dedicated to all the gods, has a great arched roof, lighted through one opening in the center of the dome. The Pantheon in Rome is the only ancient building that has been completely preserved. It was built by Agrippa in 27 B. C. It was consecrated as a church in 610, and is used as a burying place for eminent Italians. The Pantheon of Paris was built in 1764, and called the Church of St. Genevieve. It is also used as the mausoleum of famous men.

Panther, the name loosely applied to the leopard, but more correctly used for the stouter varieties of that animal. The puma is also called panther in America.

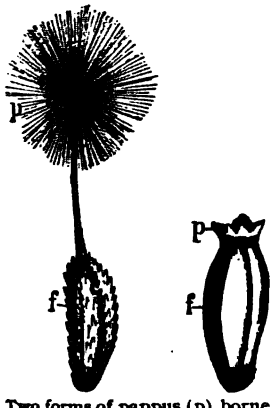
Paoli (*pä'ō-lē*), **Pasquale,** a Corsican patriot, was born in Corsica in 1726; was taken to Naples by his father in 1739, but returned to his own country to become the leader of the struggle for independence in July, 1755. He would have succeeded but that Genoa sold Corsica to France in 1768. He held out for a year against the French, but on being defeated escaped to England, where he was given a government pension. On the breaking out of the second revolution in France, he returned, became lieutenant-general and governor, and set on foot a second rebellion, hoping to form a union with England, but failed, and returned to England in 1796. He died near London, Feb. 5, 1807. See Boswell's *Account of Corsica.*

Paper takes its name, probably, from that which was first used in its place and from which it was first made — Egyptian papyrus. It was first made by laying thin slices of the cellular tissue across others, the whole moistened with Nile water and pressed, then smoothed down with ivory or shell. In the 10th and 11th centuries it was made of other fibrous matter. The Chinese encyclopedia says that the Chinese first wrote on thin strips of bamboo board, but for 300 years before and after Christ silk waste was used. The Chinese statesman, Ts'ai Lun, was the inventor of paper made of vegetable fiber. In 105 A. D. he had made paper of bark, hemp, rags, and old fishing nets. The first manufacture of rag paper in Europe was in Spain under the Moors in 1154, but soon afterward it was made in Italy, France, and Germany. It came into universal use in the 14th century. The vegetable fibers from which paper can be made are wood, bamboo, jute, straw, cornstalk, flax, hemp, besides linen and cotton rags for white paper. The pulp is ground fine and mixed with a slightly mucilaginous water in a large mash tub or drum. From the orifice in this drum the pulp or mash is slowly run into a series of very hot rollers of polished steel. The flowing of the mash is continuous, and as the sheet of pulp passes through the rollers, the rollers are tightened from time to time until the paper is thoroughly pressed, dried, and reduced to the proper thickness. The first mill in the United States was built in 1690, where Philadelphia now stands, and

to-day the paper output in America is the largest in the world, being about 2,000,000 tons a year. Next in order is England, then come France, Germany, Austria, and Italy. See works on *Paper and Paper Making*, by Hoffman, Munsell, Archer, and Dunbar.

Papier-mache (*pā-pyā'-mā-shā'*), a name applied to paper pulp, pressed and treated to resemble wood or plaster. Articles made of the pressed-pulp or of sheets of paper pasted together on a mould were first made in Persia and Cashmere in the shape of small cases, boxes, and trays. In Japan, helmets were often made in the same way. In the 18th century, one Martin began the manufacture of peculiarly varnished papier-maché snuffboxes in France, and in 1772 Henry Clay, an Englishman, received a patent for the preparation of sheets pasted together, forming door panels, tables, cabinets, and trays. The tray of sheets is formed on the mould, heated and dipped into a mixture of linseed oil and tar, then placed in the stove and afterward planed and filed. Then it is given several coats of tar and lampblack, after which it is varnished and polished by hand. The papier-maché combination has been used for doors, water pails, and even for car wheels, with success.

Pappenheim (*pāp'en-him*), **Gottfried Heinrich,** Count von, a great imperialist general in the Thirty Years' war, was born May 29, 1594, at Pappenheim, Bavaria, and at the age of twenty went over to the Catholic church. He served under the king of Poland against the Russians and the Turks, and then joined the Catholic league, defeating the Bohemians at Prague in 1620. Again, in 1626, in the Austrian service, he suppressed the peasant revolt, in which 40,000 peasants died, and then fought against the Danes, Swedes, and Saxons of the Protestant league. At Lützen, in 1632, he arrived in time to save Wallenstein from defeat by the Swedes, but was mortally wounded in the second charge and died at Leipsic, Nov. 17, 1632, pleased that Gusavus Adolphus had died just before him.



Two forms of pappus (p) borne at the summit of akenes (f).

Pap'pus (in plants), the highly modified calyx of the flowers of the *Compositæ*. As the flowers are epigynous (which see), the pappus appears to rise from the summit of the seed-like fruit ("akene"), and occurs in a great variety of forms. Sometimes it is a tuft of delicate hairs, as in the thistle and dandelion; sometimes two or more tooth-like and often barbed processes, as in tick-seed, beggar's ticks, and Spanish needles; sometimes beautifully plumose bristles, as in the blazing star; sometimes simply a cup or crown; and sometimes wanting altogether. In general, the pappus is developed to aid in the transportation of the akenes by wind or animals.

Papua (*pap'ō-ä*). See NEW GUINEA.

Papy'rus, a species of the genus *Cyperus*, which belongs to the sedge family, and contains over 600 species distributed throughout the temperate and tropical regions. The papyrus is *C. papyrus*, and is native to Egypt and Palestine. It is of interest in connection with its ancient use by the Egyptians. "The pith-like tissues of the larger flowering stems were cut into thin strips, united together by narrowly overlapping margins, and then crossed, under pressure, by a similar arrangement of strips at right angles, constituted the papyrus of antiquity." It is commonly cultivated in aquaria or in damp soil. The stem is tall and stout, from four to eight feet in height, and bearing at the summit a rosette of drooping leaves.

Para (*pä-rä'*), a city of Brazil, is 70 miles from the mouth of the river Pará. It has a fine harbor sheltered by wooded islands, which admits large vessels. It is closely built, with narrow streets, well shaded by mangoes and palms. It has street cars and telephones, and among its public buildings, a theatre, custom house, and cathedral. Here are the headquarters of the Amazonian Steamboat company, which has most of the Amazon river trade, supplying the interior towns with foreign goods and exporting india rubber, cacao, Brazil nuts, etc. The rubber exported from Para in 1898 amounted to 22,218 tons. Para is also a state or district in Brazil, with an area of 443,790 square miles, and a population of 328,455. See *Around and About South America*, by Vincent.

Paraffin (*par'a-fin*), the name given by Baron Reichenbach to a white, transparent substance obtained by him from wood tar in 1830. An English chemist, Christison, obtained the same substance, about the same time, from petroleum and called it petroline, and the French chemist, Dumas, obtained it from coal tar in 1835. Not until 1850, however, was it manufactured, and it is now used almost entirely for the making of candles, and in some branches of the arts and surgery. It is made largely from petroleum shale by the following process: The shale is broken and placed in a retort, is then distilled and treated with chemicals, after which it is cooled, when the paraffin separates as a solid and the heavy oil mixed with it is pressed out. Then the crude paraffin is treated with naphtha and the naphtha removed by further pressing after it has cooled. The paraffin is then melted and allowed to run through filters into

convenient shapes. Paraffin is obtained also from mineral wax and from the higher boiling portion of ordinary petroleum.

Paraguay (*pä-rä-gwā'*), a republic of South America, is divided by the river of the same name into eastern, or Paraguay proper, and western, or Chaco. The eastern part is bounded on the north by the Apa and Estrella rivers, on the east by the Amambay mountains and the Paraná river, and on the south by the same river. The boundaries of western Paraguay have not been fully determined. The total area is about 157,000 square miles, and the estimated population, made up of white descendants of the Spanish, Indians, and negroes, and mixtures of all, is about 432,000. The Amambay range runs from north to south, and divides the basins of the Paraguay and Paraná, whose small tributaries frequently overflow. The northern portion of the country is hilly and broken by palm-dotted plains, but the southern part is one of the most fertile regions of South America. The great forests along the rivers furnish dyewoods, valuable juices, india rubber, and a shrub known as Paraguay tea, which is in general use in South America. The crops raised are those of corn, coffee, rice, cocoa, indigo, tobacco, manioc, and sugar cane. The climate, although temperate for this region, gives life to many tropical animals and snakes. The commerce of the country, until 1880, was insignificant, but it began a steady increase in that year, and by 1899 the export of yerba-maté (Paraguay tea), tobacco, hides, oranges, timber, tanbark, and lace, had more than doubled, while the manufacture of pottery, bricks, laces, ponchos, soap, food pastes, and brandy, and tanning of leather, also increased greatly. On the grazing lands of the republic, in 1899, were 2,500,000 horned cattle, 370,000 horses, mules and asses, 300,000 sheep, goats, and pigs. The established religion is Roman Catholic, and education is free and compulsory, but of the adults only one in five can read and write.

The country was discovered by Juan Diaz de Solis, in 1515, and the first colony founded by De Mendoza, in 1535, who built the city of Asuncion and made Paraguay subject to Peru. It fell into the hands of the Jesuits, who administered its affairs until 1768, when they were expelled. In 1810, it declared its independence and elected a dictator, who held office from 1814 to 1840. Under the new constitution of 1844, Don Carlos was elected president and was succeeded by his son in 1862. This son led the war with Brazil, Argentine, and Uruguay, and was killed in battle, March 1, 1870. A new constitution, providing for two houses of congress, was proclaimed Nov. 25, 1870, upon which was begun the new presidential term of four years. The capital is Asuncion (population 45,000), and the next largest city Villa Rica (population 25,000). From Asuncion there is now a railway (156 miles in length), to Pirapó. At Asuncion there is, besides a state college, an agricultural school and model farm. See *History of Paraguay*, by Washburn, and Vincent's *Around and About South America*.

Par'aguay', a river of South America, rises in the Brazilian state of Matto Grasso, and flows southwesterly into the Paraná. Its largest tributaries are the Jauru, Cuyabá, Tacuary, Mondego, Apa, Pilcomayo, and Vermejo. The river is 1,800 miles long, and is navigable to the mouth of the Cuyabá. It was declared open in 1852, and now has steamers running upon it, carrying mail from Rio Janeiro to Cuyabá.

Parallax (*pär'al-lăks*), an optical and astronomical term used to denote the change in direction of an object due to a change in the position of the observer. This phenomenon is, perhaps, most easily observed in viewing a landscape from a railway train. When one's attention is concentrated upon any point in the landscape, all the more distant points appear to move in the same direction as the train, while the nearer points appear to move in a direction opposite that of the train. Thus, as the observer continually changes his position, being on the moving train, the direction of the point to which his attention is directed is continually changing. In the same way, if one could suddenly step from Chicago to New York, on any moonlight night, the position of the moon among the fixed stars would also suddenly change. And since the earth is rotating and carrying the observer with it, the position of the moon, or of one of the planets, among the fixed stars, depends upon the hour of the day at which the observation is made, as well as upon the latitude and longitude of the observer. Accordingly, astronomical observations of this kind are all "reduced" to the center of the earth; that is, the position of a heavenly body is given as that which it would appear to have for an observer situated at the center of the earth. Parallax of this kind is called *diurnal*. There is also a parallax due to the motion of the earth in its orbit about the sun; this is known as *annual* parallax, because it goes through all its changes in the course of one year. The principle of parallax is one of great usefulness in adjusting certain optical instruments, and in making certain optical measurements. See Young's *General Astronomy*.

Paramaribo (*par-a-mar'i-bō*), the capital of Dutch Guiana, lies on the Surinam, about ten miles from its mouth. It has broad streets, wooden houses, a governor's palace, a court of justice, two forts, and a park. Almost all the trade of Dutch Guiana is centered here. Population 31,200.

Parana (*pä-rä-nä'*), a large South American river, rises as the Rio Grande about 100 miles northwest of Rio de Janeiro. Flowing northwest and west, it unites with the

Paranahyba, and receives its name and flows southwest and south to where it is joined by the Paraguay. It then flows through Argentine, uniting with the Uruguay to form the Rio de la Plata. Its total length is nearly 2,000 miles, and it drains over 1,100,000 square miles of territory. Its longest tributaries are those named and Mogy Guassu, Tieté Paranapanema, Ivahy, Iguassu, and Salado. It is navigable for 705 miles, and has rapids over 100 miles in length immediately above the junction with the Iguassu. Paraná is also a state or department of Brazil, area 85,430 square miles, with a population of 250,000.

Parasites (*păr'ā-sīts*), among plants those which obtain food by attacking living plants or animals. The majority of parasitic plants are fungi (which see). Many of them have cultivated a very selective habit, restricting themselves to certain plants or animals, or even to certain organs. Some of the highest plants are also parasitic, as, for example, the dodder, whose thread-like body is often seen enwrapping tall herbs like skeins of yellow yarn; and the mistletoe, growing in tufts on the branches of trees. In every case the plant or animal attacked is called the "host." Sometimes the attacks are harmless, but often they are very destructive. The results of the most destructive parasites have come to be spoken of as diseases, and among them are some of the common contagious diseases.

Parch'ment, the prepared skins of sheep, goats, and calves, generally used to record wills, deeds, etc. The coarser kinds are used for drumheads and tambourines. After the hair is removed from the skin, it is stretched over a board and scraped on both sides, powdered chalk is spread on the flesh side, and then it is gone over with a pumice stone and rubbed until smooth. Unsized paper is sometimes dipped for a few moments in a solution of sulphuric acid, which renders it transparent, tough, and impervious to water. This is called vegetable parchment, and is much used. Vellum is a fine parchment made from the skins of kids, lambs, and young calves. Parchment has been used for writing upon since the earliest periods, and from the 10th to the 14th century was almost the only material that could be used for that purpose.

Pare (*pā-rā'*), **Ambroise,** the first practitioner of modern surgery, was born at Laval, France, about the beginning of the 16th century, and received his training at the Hôtel Dieu in Paris. In 1536, he joined the army, going to Italy as surgeon, and in a later campaign improved the then treatment of gunshot wounds by tying the broken arteries, instead of burning them with a red-hot iron after amputation, and made many other changes. In 1552, he became surgeon to Henry II., and afterward to Charles IX. and Henry III. His principal writings, *Five Books of Chirurgy*, have been a great aid to modern surgeons. He died at Paris, Dec. 22, 1590. See his *Life*, by Paulmier.

Parenchyma (*pa-rĕn-kĭ-ma*), the tissue in plants whose cells have thin walls, and their three dimensions approximately equal. They are the working cells of a plant, as distinct from the mechanical tissues. Parenchyma is the original tissue of every plant, and by its various modifications new tissues arise. Ordinary pith is a good illustration of dead and empty parenchyma cells.

Par'is, the capital of France and the second city in Europe, is situated on the river Seine, about 110 miles from its mouth. It is the center of a network of rivers, canals, and railroads. It is divided into two parts by the river Seine, and surrounded by a range of hills from two to five miles distant. The fortifications consist of a rampart, over 22 miles in length, with 57 gates, which it took twenty years to build, and beyond are 16 forts. The houses are built of a light-colored limestone, six or seven stories high, each floor making a distinct dwelling. Some of the finest streets are the Rue de Rivoli, Rue de Faubourg, St. Honoré, and the Rue Royale. The boulevards, or broad streets, extending in a semicircle, on the right side of the Seine, are lined with trees, seats, and stalls, while restaurants, shops, and places of amusement succeed each other for miles. The city has many beautiful squares, called places, among the finest being the Place de la Concorde, the Place de Carrousel, Place de la Bastille, and the Place Royale. In the Place de la Concorde is the obelisk of Luxor, brought from Egypt, 73 feet high, and covered with hieroglyphics. Here also was the site of the guillotine during the revolution. On the Place Vendôme stands Napoleon's column of victory. There are a number of fine triumphal arches in Paris: the Porte St. Denis, erected by Louis XIV., is adorned with basreliefs representing his victories, and the Arc de l'Etoile (Arch of the Star), begun by Napoleon in 1806, and costing $2,000,000, has the names of 384 generals and 96 victories inscribed on its walls. Ten avenues lead from this arch, one of them, the Avenue Bois de Boulogne, bordered by gardens and leading to the Bois de Boulogne park, considered one of the finest streets in the world. Another fine avenue, more like a park than a street, is the Champs Élysées (Elysian Fields). The river Seine is crossed in Paris by over 30 bridges, which communicate with spacious quays, planted with trees, affording fine walks along the banks of the river. Of these bridges, the recently-constructed Alexander III. bridge cost over a million dollars.

The Louvre, the finest modern palace in Paris, is built on the site of an old castle of the 13th century, and is connected with the palace of the Tuileries by a great picture gallery. It is filled with sculptures, paintings, and collections of Greek, Roman, and Egyp-

tian antiquities. The Tuileries was burned by the commune during the siege of Paris. The Palais Royal, the palace of the Luxembourg, the Hotel de Ville, the Palais de Justice, and the old prison, the Conciergerie, are all noted buildings. The Cathedral of Nôtre Dame, begun in the 12th century, is one of the finest specimens of Gothic architecture in the world. The Sainte Chapelle was built by Saint Louis to contain the crown of thorns and a piece of the true cross, brought by him from the Holy Land. St. Germain des Près, finished in 1163, and probably the most ancient church in Paris, contains the tomb of St. Genevieve, the patron saint of Paris. The Madeleine, the Pantheon, and l'Oratoire are some of the best known of the modern churches. The Grand Opéra is one of the most sumptuous of continental theatres.

The institutions connected with the University of France are in the Latin quarter of the city. There are found the Sorbonne, with its lecture rooms and class rooms and large library open to the public; the College of France; and a large number of colleges and lyceums, and schools of engineering, roads and bridges, charts, fine arts, etc.; and also the observatory and botanical gardens. The national library has the largest collection of books in the world, except that of the British museum. The art galleries and historical collections of the Louvre, historical museum, Hotel Cluny, the palace of fine arts, and museum of artillery, are among the richest collections in Europe.

The business of Paris is largely in articles of luxury, such as jewelry, bronzes, artistic furniture, gloves, watches, and perfumery. It is a great financial center, the Bank of France having the privilege of issuing all the banknotes in France, and the mint being located here. Paris is divided into 20 districts, governed by the préfect of the Seine, appointed by the government, and a council elected by the people.

Paris is named after the Parisii, a tribe of Gauls, whose collection of mud huts stood upon its site when conquered by the Romans. In 53 B. C., Lutetia, as it was then called, was an important Roman town; an amphitheatre of that period, capable of holding 10,000 people, has been laid bare by excavations. In the 4th century the city was called Paris, and in the 6th century it was chosen by Clovis as the seat of government, though it did not become permanently the capital of France until the 10th century. In the reign of Philip Augustus, from 1180 to 1223, Paris was, next to Constantinople, the greatest city in Europe; with its university attracting crowds of students, its churches of Nôtre Dame (partly built) and St. Chapelle, and the castle of the Louvre, the citadel of Paris. Louis XI., Henry IV., and Louis XIV. improved the city, organizing its police, drainage and sewerage systems, public schools and charities. Napoleon not only removed the marks of the terrible destruction of the revolution, but built up the city on a grander scale, with new bridges, streets, squares, arches, and public gardens, spending on its restoration more than $2,000,000 in twelve years. Yet, as late as 1834 the gutters ran through the middle of the streets; there were scarcely any side pavements, and the city was lighted by oil lamps suspended on cords across the streets. Modern Paris owes its beauty to Napoleon III. Under the direction of Haussmann his plans were carried out, broad, straight streets were built through the labyrinth of dark and narrow ones, boulevards constructed connecting all the public squares, and in place of the old houses in the heart of the town, torn down to make way for his improvements, a new city was built. Water was freely supplied, and trees and gardens and fountains sprang up everywhere, making Paris one of the greenest and shadiest of modern cities. In 1867, when the international exhibition was opened, and especially in 1900, when the exposition of that year was held, Paris was the most splendid city in Europe. The siege of Paris by the Germans in 1870, followed by the terrible destruction made by the commune, destroyed many of the finest buildings and historical monuments that can never be replaced. Under the republic, new streets have been opened; the Champs de Mars (field of Mars) changed into a beautiful garden, in which rises the Eiffel tower; a system of city railroads planned which connects the railroad stations with the heart of the city, and also the deepening of the Seine, making Paris a seaport, which will do much to make Paris the center of the world's commerce. Population 2,536,834. See *Paris in Old and Present Times*, by Hamerton.

Par'is, a Greek legendary character, sometimes called Alexander, was the second son of Priam and Hecuba, rulers of Troy. Before his birth his mother dreamed that she was to bear a firebrand which would burn the city. So his father took him to Mount Ida, where he was found after five days by Agelaus, a shepherd, after having been fed by a bear. He became reconciled to his father and afterward was made umpire by the three goddesses Juno, Minerva, and Venus as to which one was entitled to the golden apple of discord. Venus bribed him by offering him the most beautiful woman as a wife and he decided in her favor. He thereupon carried away Helen, the wife of Menelaus, and caused the Trojan war. In it he killed Achilles and was himself wounded by a poisoned arrow from which he died.

Par'is, Count de (Louis Philippe Albert d'Orleans), a descendant of the French Bourbons, son of the Duc d'Orleans, grandson of King Louis Philippe and claimant to the throne of France. He was born at Paris, Aug. 24, 1838; educated in England and

acquired considerable military experience during the Civil war in America as a member of the staff of Gen. George B. McClellan. When a boy of ten he appeared in the French chamber of deputies with his mother, but his claims were repudiated by those who came into power during the revolution of 1848. He traveled extensively in the east and in northern Africa, acquitted himself honorably in arms, and won considerable reputation as an author. He married in 1864 his cousin, the daughter of the Duc de Montpensier, by whom he had six children. He was admitted to the national assembly in 1871, at the close of the Franco-Prussian war; and that body voted the restitution of the property of his family. In 1873, he acknowledged the Comte de Chambord as the representative of the royal house of France, but on the death of that person in 1883 he united in himself the claims of both branches of the Bourbon claimants and was forced to leave France in 1886 by reason of the Expulsion act. After this he lived in England in retirement until his son tried in 1890 to enlist in the French army in violation of the law of exile. This being detected, some excitement was caused by the apparent revival of his claims. His printed works are two, one the *History of the Civil War in America*, and the other the *Condition of the English Workman*. He died at Stowe House, Buckinghamshire, England, Sept. 8, 1894.

Park, Mungo, an African traveler, was born in Scotland, Sept. 20, 1771, became an apprentice to a surgeon at Selkirk, and then studied medicine at Edinburgh, until 1791. He then became assistant surgeon on the *Worcester* and on his return offered his services to the African association and sailed from England, May 22, 1795. After learning the Mandingo language at Pisania he set out, but soon fell into the hands of a Moorish king, who made him prisoner, and from whom he escaped in 1796. In the third week of his flight he reached the Niger, which he followed to Silla and there crossed the mountains into the kingdom of Mandingo, where he lay ill for some time. He was taken back to Pisania and wrote an account of his travels in a work, *Travels in the Interior of Africa*. In 1799, he married at Selkirk, but the life of a country surgeon was too quiet for him, so in 1805 he sailed for the Niger country, in Africa, on behalf of the government. He worked up the Niger river, and with four Europeans embarked in a canoe, which was caught in the rocks at Baussa and attacked by the natives. He and his companions were drowned before any of them could escape. His account of the second voyage was published in 1815, and has been of much value to subsequent explorers. See Joseph Thomson's *Mungo Park*.

Parke, Edwards Amasa, an American theologian, was born at Providence, R. I., Dec. 29, 1808. He was a graduate of Brown university and of Andover Theological seminary. He was appointed professor of philosophy at Amherst college in 1836, going from there in 1847 to Andover seminary, where, as professor of rhetoric and afterward of theology, he spent the remainder of his life. Besides his great work as a theological teacher, he has written extensively for magazines, and edited with others the *Bibliotheca Sacra*. He has edited also several volumes, such as the *Writings of Professor B. B. Edwards*, and *Discourses on the Atonement;* and with Lowell Mason and Dr. Phelps he prepared the *Sabbath Hymn Book*.

Parke, John Grubb, General, was born near Coatesville, Penn., Sept. 22, 1827. He studied at West Point, graduating in 1849. He then began his career as topographical engineer, and his chief work was on the survey of the northwest boundary until the Civil war broke out. In November, 1861, he was appointed brigadier-general of volunteers, and went with Burnside into North Carolina, and in August following joined the army of the Potomac with his chief. He was Burnside's chief of staff at the battles of South Mountain and Antietam, and also when he took command of the whole army. General Parke commanded the ninth corps in its march to Vicksburg, after the battle of Fredricksburg. Later he had command of the left wing of General Sherman's army at Jackson, July 12, 1863, and afterward at the head of a division, he led in the defense of Knoxville. In the campaign of 1864 against Richmond he again took command of the ninth corps until Lee's surrender. In 1864, he was made major in the engineer's corps, rose to the rank of colonel in 1884, and was made superintendent of the West Point Military academy in June, 1887. Two years later he retired. He has written several works relating to his explorations and surveys, etc.

Park'er, Gilbert, Anglo-Canadian novelist and English member of parliament, was born in Canada, Nov. 23, 1862, and educated at Trinity university, Toronto, from which he holds the degree of D. C. L. He was trained to journalism in Australia, and there first began his literary and dramatic work. His novels include *Pierre and his People*, *Mrs. Falchion*, *The Trespasser*, *When Valmond came to Pontiac*, *The Seats of the Mighty*, which has also been dramatized, *The Pomp of the Lavilettes*, *The Battle of the Strong*, and *The Right of Way*.

Par'ker, Theodore, a great American preacher, was born Aug. 24, 1810, at Lexington, Mass., and graduated from Harvard Divinity school in 1836, and the next year became a Unitarian minister at West Roxbury. He was somewhat separated from the conservative Unitarians, as shown by his *The Transient and Permanent in Christianity*, and his *Discourses of Matters pertaining*

to Religion, followed by *Sermons of the Times*, all of which attracted widespread notice and comment. His complete works, in 12 vols., edited by F. P. Cobbe, were published in 1863–65. After a trip to Europe for his health, he returned in 1844 and for years preached to immense congregations at Melodeon and Music halls, Boston. He also lectured throughout the country and became an ardent anti-slavery agitator, but was stricken with bleeding of the lungs in 1859, and from Mexico went to Italy, where he died at Florence on May 10, 1860.

Par'kersburg, W. Va., the capital of Wood county, at the junction of the Ohio and the Little Kanawha rivers, 12 miles southwest of Marietta, O., and 95 miles below Wheeling, W. Va. It is on the lines of the Baltimore and Ohio, the Baltimore and Ohio South Western, and the Ohio railroads. The region about is rich in oil and natural gas, and has a considerable trade in petroleum, as well as in lumber. Its industries include oil refineries, iron foundries, boiler and machine shops, barrel factories, lumber mills, and chemical works. It has many public buildings, with a fine post office, courthouse, high and public schools, churches, banks, etc. Population 11,703.

Park'man, Francis, an eminent American historian, was born at Boston, Mass., Sept. 16, 1823. He graduated at Harvard in 1844, and after studying law two years made a journey to explore the Rocky mountains. His life among the Dakota Indians and other tribes was full of hardships, from the effects of which he suffered all the remainder of his life. His first publication was an account of this journey, called *The Oregon Trail*. His historical writings have been chiefly connected with the French power in America, beginning with *The Conspiracy of Pontiac*, (in historical order, the latest) published in 1851. After visiting France, in 1858, to study French documents on the subject, he wrote in 1865 *Pioneers of France in the New World; Jesuits in North America* in 1867; *Discoveries of the Great West* in 1869; and *The Old Régime in Canada* in 1874; *Count Frontenac and New France under Louis XIV.* in 1877; and *Montcalm and Wolfe* in 1884; and *A Half Century of Conflict* in 1892. This large amount of historical writing, done at great disadvantage from defective eyesight and feeble health, has been carefully and accurately worked out, his first visit to France being followed by several others for purposes of research. His literary style is picturesque and fascinating. He died at Jamaica Plain, near Boston, Nov 8. 1893.

FRANCIS PARKMAN.

Parks, National, a term used in the United States to designate lands set aside by the authority of the national government for public use, is applied both to historic battle fields which have been purchased, and to picturesque regions withdrawn from settlement. The most celebrated battle parks are those of Gettysburg and Chickamauga; the first of which embraces 800 acres and the second about 15 square miles. Roads have been built all through these grounds, and beautiful monuments erected to commemorate especially brave exploits or critical moments in the battles fought upon the ground. In 1895, the battle field of Shiloh, embracing 3,000 acres, was set aside by congress; but as yet this park is in its incipiency. Of the natural parks, the chief are the Yosemite and the Yellowstone. The Yellowstone Park covers about 4,480 square miles, and is 6,000 feet above the level of the sea. The mountains about it rise to a height of from 10,000 to 12,000 feet. In it are found many of the greatest natural wonders of the continent, if not of the world; geysers, hot springs, ice-cold fountains, and noble forests all conspiring to make it a "wonderland." The Yosemite Park, including the Mariposa Grove, is one of the most picturesque valleys conceivable, lying in a trough of the mountains 4,000 to 6,000 feet deep, six miles long, and from half a mile to a mile and a half wide. Through it flows the beautiful Merced river, fed by glaciers and snow fields. The Mariposa Grove is noted for its Giant Trees, the Sequoias, some of which attain a height of 275 to 375 feet and a girth of from 75 to 125 feet. All these parks are patrolled by United States troops and both flora and fauna are protected from injury.

Par'liament, the name given in England to the national assembly, and meaning a gathering for discussion, from the French word *parler* "to talk." It consists of two bodies, called the house of lords and the house of commons. The house of lords is composed of the lords spiritual or the clergy, represented by the archbishops of Canterbury and York and 32 bishops; and the lords temporal, who represent the noble families of England, Scotland, Ireland, and Wales. The titles used are duke, marquis, earl, viscount, and baron, and they are commonly called peers. The crown has the right to make new peers in addition to those who inherit their titles. In 1900, there were 593 peers on the roll of the house of lords. The chief officer of the house of lords is the chancellor, or keeper of the great seal, who acts as speaker, but does not keep order. The house of commons consists

of members elected by the people, representing counties, towns, and the universities. The larger counties and towns (or boroughs) are divided into districts, each one being entitled to a representative. There are now (1901) 670 members in the house of commons, 30 from Wales, 72 from Scotland, 103 from Ireland, and 465 from England. The chief officer of the house of commons is the speaker, chosen by the members. The members receive no salary, but have certain privileges. Parliament is called or dismissed by the government, but by law there cannot be more than three years between the closing of one parliament and the calling of a new one, and no parliament can hold its sessions longer than seven years. The decisions of parliament cannot be changed by any court of law. The houses of parliament are in Westminster, a part of London. The acts of parliament must receive the approval of the reigning sovereign, which is obtained through the ministers or members of the cabinet council. The royal assent has been given to every bill which has passed the two houses since the time of Queen Anne. The name parliament dates back to the 13th century, and the conflicts between the people and the throne, which have gradually increased the powers of parliament, are the chief theme of English history.

Par'ma, an Italian town, the former capital of the duchy of Parma, lies on the river Parma, 12¼ miles from the Po, on the Emilia road. The town is still surrounded by walls and is guarded by a citadel. Of more than 60 churches, the most noted are the cathedral, the baptistry, Madonna della Steccata, and St. John the Evangelist. Other notable buildings are the ducal palaces, library, university, music school, and museum. The principal manufactures are pianos, silks, cast iron goods, woolens, earthenware, paper, soap, etc. A state university, founded in 1512, has its seat here. Population 55,205.

Parnas'sus, a mountain in Phocis, Greece, upon whose highest peak (8,036 feet) occurred the worship of Bacchus. The mountain was the seat of Apollo and the Muses and at its base lay the seat of the oracle of Delphi and the fountain of Castalia.

Par'nell, Charles Stewart, an Irish politician, was born June 28, 1846, at Avondale, Wicklow county, Ireland, educated at Yeovil and Cambridge, and in 1874 became high sheriff of his county. In 1875, he entered parliament for County Meath as a home ruler, and in 1877–78 became notable as an obstructionist. In 1879, he was elected president of the Irish National Land league, and in 1880 visited the United States, making speeches in behalf of the movement and collecting $350,000 in its aid. On his return he was elected from counties Meath and Mayo and the city of Cork, and chose to represent the latter. On Sept. 19, 1880, at Ennis, he originated the system of boycotting an unpopular person. Gladstone caused the arrest and trial of the leaders of the party, but upon a disagreement of the jury they were set free. Then Parnell's opposition to the coercion bill caused him to be ejected from the house of commons, and the passage of the land bill almost deprived him of power. On Oct. 13, 1881, Gladstone put him in Kilmainham jail, where he remained until released through the aid of Captain O'Shea, May 2, 1882. After the land league was declared illegal, the national league arose from its disruption, and Parnell was elected its president, and began to manœuvre to throw his parliamentary strength to the conservative side. Failing in this, he carried 86 votes over to the liberals. To a great extent Gladstone's views on home rule had changed, and this brought Parnell politically close to him, but they together failed to carry the home rule bill. Thereupon the London *Times* printed its series of incriminatory articles, which caused the famous trial of 128 days, in which Parnell was cleared. He was now immensely popular and powerful, but the presentation of the freedom of the city of Edinburgh was quickly followed by disgrace on the publication of the application for divorce by Captain O'Shea, in which Parnell was made co-respondent. A decree taxing him with the costs was entered Nov. 17, 1890. The Gladstone party then demanded his retirement from politics, and gave the Irish their choice between it and Parnell. They re-elected Parnell leader, but his disgrace caused great defection in the ranks of his followers, the city of Edinburgh erased his name from the rolls, and many of his nominees were defeated. Some time after the entering of the decree of divorce, Parnell married Mrs. O'Shea. He, however, never regained his political power, and died at Brighton, England, Oct. 6, 1891. See *Parnell Movement*, by T. P. O'Connor, and *England under Gladstone*, by Justin H. M'Carthy.

Pa'ros, one of the largest islands of the Greek Archipelago of the Cyclades division, is of pyramidal shape, has an area of about 64 square miles, and a population of nearly 7,000, of which its capital, Parœkia, shelters 2,200. Its exports are wine, wool, and figs, and the quarries of celebrated Parian marble near the top of Mt. St. Elias are still worked.

Parrhasius (*par-rā'shi-us*), a great painter of ancient Greece, lived in Athens, as early as the 4th century B. C. He excelled in design, accuracy, force, and expression, and was said to be as vain and proud as he was talented.

Par'rot, a tropical bird, with short hooked bill, a thick fleshy tongue, and usually brilliant plumage. The parrot family is a large one, embracing about three hundred and fifty species. It includes macaws, cockatoos, love birds, true parrots, and parrakeets. They live usually in flocks, either in forests or on

grassy plains. Their food is mainly vegetable, consisting of fruits, seeds, buds, leaves, and the like. The Macaws, inhabiting South America, are the largest parrots. They have long pointed tails. The red and blue colors of their plumage often make inharmonious contrasts. They are noisy birds and do not talk well. The cockatoos (which see) are crested. The parrots proper have short square tails and are birds of moderate size. The parrakeets are the smaller green parrots, like the Carolina parrakeet of the southern United States. The voice of parrots is naturally harsh, but many can be taught to speak. They vary much individually in their capacity for imitating sounds. The Jako, or gray parrot of Africa, has the capacity for speaking best developed, and the yellow-headed green parrot of Mexico stands second in the list.

Par'rott, Robert Parker, an American inventor, was born at Lee, N. H., Oct. 5, 1804. He graduated from West Point, and was professor of mathematics and also of natural philosophy there. His active service in the army was in the war against the Creeks in 1834. In 1836, he was put in charge of the West Point iron and cannon foundry, and while there invented the system of rifled-guns and projectiles which bears his name. These guns were first used at the battle of Bull Run, in 1861. He died at Cold Spring, N. Y., Dec. 24, 1877.

Par'ry, Sir **William Edward,** an Arctic explorer, was born at Bath, England, Dec. 19, 1790, and entered the navy in 1806. In 1810, he commanded a ship sent to the Arctic to protect the whale fisheries, and afterward commanded five expeditions; in 1818, to find the Northwest passage; in 1819, exploring Barrow strait, Regent's inlet, and Wellington channel; in 1821 and 1824, with no results; and in 1827 with an attempt to reach the pole in sledges from Spitzbergen. He was knighted in 1829, became rear-admiral in 1852, and in 1853 was appointed governor of Greenwich hospital, which office he held to the day of his death, July 8, 1855, at Ems, Germany. See *Life*, by his son.

Par'sees is the name of the few remaining followers of the Persian religion of Zoroaster. When Zoroaster lived, or whether he lived at all, is a question, but that which remains of the alleged teachings shows that at first the belief centered in a single god, but that the god had two spirits, a reality and a non-reality, which soon led to the worship of two gods, a god of good and one of evil. The religion flourished up to the time of Alexander the Great, but after his death it declined until 212 A. D., when Artaxerxes caused the book (Zend) to be restored, and spread it throughout the land. The priests, of whom there were 40,000, became very powerful, and the religion flourished again until the defeat of the Persians in the battle of Nahavand by Omar in 641 A. D. Thereupon the greater portion became Mohammedans, but many fled, some going to India, where they now live under English rule and are much respected. In 1891, there were 89,904 Parsees in British India; and in Persia there are about 9,000 Parsis or Guebers. They eat nothing cooked by a person of another religion, and no beef or pork; prohibit polygamy, and do not bury their dead, but expose the bodies upon an iron grating. The symbol of their god is the sun and the worship is by a perpetual fire upon the altars. See Monier Williams, *Modern India.*

Par'sons, Father **Robert,** once head of the English Jesuits, was born in 1546 in Somersetshire, and went from Oxford to Baliol college, where he took his degrees and became a tutor, twice taking the oath abjuring the pope, but never taking orders in the English church. He was forced to retire from Oxford and shortly afterward, becoming a Roman Catholic, he went to Padua to study medicine, but changed his mind and went to Rome, where he offered himself to the Jesuit society in 1575 and became a Jesuit priest in 1578. In 1580, he was selected, with Campion, to do Jesuit missionary work in England, and landed there in disguise on June 11, immediately beginning vigorous, secret, and highly successful work. For a year he continued, but when Campion was taken, Parsons escaped to the continent and never returned to England. Although cautioned not to interfere in matters of state, he began to formulate plans for a Catholic invasion of England which terminated in the unsuccessful Armada, after which he organized theological seminaries at Valladolid, St. Lucas, Seville, Lisbon, and St. Omer. He died at Rome on April 18, 1610. Some of his best-known writings are *The Conference on the Next Succession to the Crown*, in which he advocated the right of the people to depose the natural heir for religious reasons, and the possession of a copy of which Parliament regarded as treasonable; *Reply to the Edict of Elizabeth; Memorial for the Reformation; His Apology* and *Manifestation of the Great Folly and Bad Spirit of Certain in England Calling Themselves Secular Priests.*

Parthenogenesis (*pär'the-no-jĕn'e-sis*). (in plants), the name applied to the production of a new plant by an egg which has not been fertilized. It is a common phenomenon in certain of the lowest plants (Thallophytes), but is very rare in the higher plants. The term is often wrongly used among seed-plants to include the formation of embryos within seeds without the presence of pollen. In most of these cases it has been proved that the embryo has not come from an unfertilized egg, but has arisen by a budding process from other cells.

Parthenon (*par'thĕ-non*), (Greek, "maiden's chamber") is the name of the temple of Athena (Pallas) in Athens, as it stands, the most perfect example of Greek architecture. Its

erection was superintended by Phidias and is built of Pentelic marble, with eight pillars in breadth and fifteen in length, being 228 feet long and 64 feet high. It stood uninjured until 1687, when it was being used as a Turkish magazine and an exploding Venetian bomb reduced it to its present state of ruin. See the Dilettanti society's *Athenian Architecture.*

Par'ties, Polit'ical, in the United States, began as early as 1787, with the discussions as to framing the national constitution. When the delegates, chosen from the several states, had agreed unanimously upon a form, there was a difference of opinion as to its merits. Prominent among its friends were Washington, Hamilton, Jay, and Madison. A series of able papers in its favor (eighty-two in number), prepared by Alexander Hamilton, of New York, were published in the *Federalist.* At once, those who sided with this view were called Federalists, and the opponents, Anti-Federalists. When Washington became President, April 30, 1789, the Federalists came into power, and Alexander Hamilton, as secretary of state, rescued the country from bankruptcy by his splendid financiering. During Washington's second term, there was a split in his cabinet, and at its close the Anti-Federalists, headed by Thomas Jefferson and Edmund Randolph, elected their candidate, Thomas Jefferson, as Vice-president, although the Federalists elected John Adams as President. Such a combination was embarrassing; but as the electoral law has been changed, it cannot again occur. The result was the defeat of Adams for a second term and the election of Jefferson to the presidency. In 1801, the Anti-Federalist administration began and the party name was changed to Democrat. This party held power until 1840, although in the election of 1824 there were four candidates in the field — all claiming to be Democrats. They were John Q. Adams, Andrew Jackson, Henry Clay, and W. H. Crawford. As no one of them was elected by popular vote, the matter was decided by the house of representatives, which placed Mr. Adams in the presidential chair. Four years later, General Jackson, the "hero of New Orleans," was elected and his administration was noted for opposition to the United States Bank, and putting into practice the doctrine that "to the victor belongs the spoils." The Whig party, which was formed in opposition to the Democratic party, and took ground in favor of a protective tariff and internal improvements, led by Daniel Webster and Henry Clay, gained its first success in the election of William Henry Harrison in 1840, but the slavery question and the death of Clay and of Webster, both in 1851, weakened the Whigs so that General Winfield Scott, in spite of his splendid military record, was defeated by Franklin Pierce, and the party ceased to exist in 1852. Several other parties arose: the Anti-Masonic party in 1826; the Liberty party in 1840, which was merged in the Free Soil party in 1848; the American party or Know-Nothings in 1854; the Republican party, made up of the Free Soil and Anti-Slavery wings of the old Whig in 1856; the Greenback party in 1866; the Constitutional Union party in 1860; the Prohibition party in 1872, and the Union Labor party in 1888. In 1856, the Democratic candidate, James Buchanan, was elected, and during his administration the Civil war began. In 1860, Abraham Lincoln was elected by the Republican party, which remained in power until 1884, when Grover Cleveland, Democrat candidate, was elected. In 1888, the Republicans elected Benjamin Harrison, and in 1892 Grover Cleveland was again elected by the Democratic party. In 1896, the Republicans elected to the presidency William McKinley, of Ohio, and in 1900 he was given a second term in the presidential chair. His chief opponent in both years for the high office was William J. Bryan, of Nebraska, the nominee of the Silver Democrat and Populist parties. The other factors in both elections were those marshaled under the banners of the Gold Democrats, the Prohibitionists, the Social Democrats, and the Socialist Labor party. In the contest of 1896, John M. Palmer, of Illinois, led the forces of the National Democrats. For Vice-president the winning men were Garret A. Hobart, of New Jersey, in 1896, and Theodore Roosevelt, governor of New York, in 1900, and now (1901) President of the United States.

Par'ton, James, an American author, was born at Canterbury, England, Feb. 9, 1822, coming to New York when five years old. He began literary work on the *Home Journal* of New York. His works are lives of Horace Greeley, Franklin, Jefferson, and Burr; *Famous Americans of Recent Times, Triumphs of Enterprise, Captains of Industry, Noted Women of Europe and America,* and a collection of the *Humorous Poetry of the English Language.* He died at Newburyport, Mass., Oct. 17, 1891.

Par'tridge, a game bird belonging to the

PARTRIDGE.

grouse family. The true partridges are Old World birds. Nevertheless, the name is

loosely applied in the United States to the ruffed grouse, which is called partridge in the north, and to the bob-white, called partridge in the south. The common partridge of England and Europe is about a foot long, of a mottled-gray color. The red-legged partridge of Europe and Asia is larger and is one of the finest game birds.

Pasade'na, a beautiful country resort of southern California, is ten miles east of Los Angeles. Its large hotel accommodates 500 people, who frequent the place as a winter resort. Population 9,117.

Pascal (*pȧs'kal*), **Blaise,** a great writer and deep thinker of France, was born June 19, 1623, in Auvergne. In 1630, he was taken to Paris by his father and carefully trained, working out difficult problems in geometry without any help, and, before he was sixteen years of age, writing a treatise on conic sections that still forms the basis of the modern treatment of the subject. Taken to Rouen in 1641, he gave himself to study and devoted much time to religion. He published his *Nouvelles Expériences sur le Vide* in 1647, and in the next year made his famous experiment in atmospheric pressure. Besides this, he invented a calculating machine. He returned to Paris in 1647, and in 1654, after the death of his father, he became converted to the Jansenists, and wrote letters in the form of tracts, which were widely distributed. His best known work is entitled, *Pensées* (Thoughts) *sur la religion.* This brought upon his head the hatred of the Jesuits. This continued until 1657, when, his health failing, he suffered until his death, at Paris, Aug. 19, 1662. See Tulloch's *Pascal* in "Foreign Classics" series (1878).

Paskevitch (*pȧs-kye'vitch*), **Ivan Feodorovitch,** count of Erivan and prince of Warsaw, a Russian general, was born May 19, 1782, at Poltava, educated in the pages' school, and, entering the army, served against the French in the war which ended in 1805. In the battles of Smolensk, Borodino, and Leipsic, and at the taking of Paris, his conduct placed him in the position of commander-in-chief against the Persians, whom he defeated in 1826–28. For this he was made count of Erivan, and afterward waged two successful campaigns against the Turks. In 1831, he suppressed the uprising at Warsaw, and was made governor. Under his rule Poland was made part of Russia. He was sent to aid Austria against the Hungarians in 1848, and in 1854 was in command of the Russian army on the Danube, but, being wounded at Silistria, he retired to Warsaw, where he died Feb. 1, 1856. See *Life*, by Tolstoi.

Passa'ic, a New Jersey city, lies on the Passaic river, eleven miles from Jersey City. It has foundries and print works and manufactories of woolens, shoddy, whips, chemicals, and india rubber. Population 27,777.

Passamaquod'dy Bay opens from the bay of Fundy on the North American coast between Maine and New Brunswick, at the mouth of the St. Croix river. It is about 15 miles long by 10 wide, and hemmed in by a cluster of islands which make an excellent harbor.

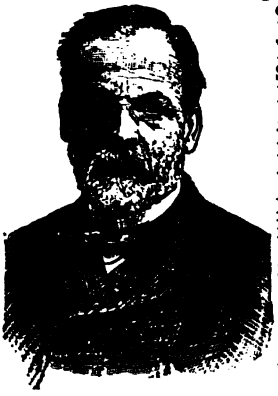
Pas'sion Flower, a species of plant almost exclusively found in the warmer parts of America, has a flower, shading from purple into light heliotrope, of five parts, with narrow lines of white from the edge of the petals meeting at the center. It received its name from the early Spanish settlers, who saw in it the crown of thorns and the five marks of the wounds of the Lord. It is a shrubby, climbing plant with lobed leaves, and some species are cultivated for the fruit, particularly the sweet calabash of the West Indies, the root of which is poisonous and acts like morphine. The roots, leaves, and flowers of some species are used as medicine.

Pass'o'ver, an annual feast of the Jews, an account of whose origin is given in Exodus xii., is the feast of unleavened bread, and originated probably when the Jews were still a wandering tribal race, and offered thanks for the year's prosperity (Gen. iv., 4). With the settlement of the Jews in Canaan, the feast and sacrifice became a fixture of the harvest time in the spring, when, after the offering of the first sheaf, the people enjoyed their corn without waiting to have their bread leavened. The celebration is accompanied by many rites spoken of in Chronicles, Ezra, and Psalms cxiii., cxviii., and in I. Cor. v., 7, and John xix., 36. See Wellhausen's *History of Israel.*

Pass'port is a paper given by a government to an individual authorizing him to leave the country, or allowing him to travel through or reside in it, affording the traveler protection. The rule has become somewhat relaxed of late, but Russia and Turkey still insist on them, while Germany requires a passport from a foreigner who wishes to reside in one place for any period of time. In England and the United States, no passports are required, but they may be obtained as a precautionary measure.

Pas'ta, Giuditta (*gwē-dēt'tȧ*), an opera-singer, was born at Como, Italy, April 9, 1798, of Jewish parents, and received her musical education at the Milan conservatory. Her first appearances on the stage were failures, and it was not until 1822, seven years later, that she scored any success. This she did at Verona, and the following year at Paris, and later at London. Her voice ranged from deep contralto to high soprano, and her chief rôles were "Medea," "Desdemona," "Semiramide," *La Sonnambula* (written for her by Bellini), "Camilla," and "Juliet" in *Romeo and Juliet.* In 1834, she retired to Lake Como, where she died April 1, 1865.

Pasteur (*päs-tür'*), **Louis,** a distinguished French chemist and biologist, was born in the department of Jura, Dec. 27, 1822. He graduated (D. Sc.) from the École Normale, in 1847, and, after holding several teaching positions, became, in 1867, professor of chemistry at the Sorbonne. He began as a chemist, but turned into microscopical work, especially along the line of bacteriology, and also ranks as a biologist. He made many discoveries of especial benefit to mankind. About 1857, he showed the process of fermentation to be due to the growth of microorganisms. In 1859, he engaged, against Pouchet, in the controversy on the spontaneous generation of life, and showed, by public experiments, the falsity of Pouchet's position, and that spontaneous generation does not occur. In 1865, he turned his attention to the diseases of the silk-worm, and, in two years, was able to arrest the ravages of a disease among them. His discoveries resulted in saving millions of dollars annually to the silk industry. His further work helped in establishing the germ-theory of disease (which see). He studied profoundly the methods of using attenuated virus for vaccination against splenic fever, hydrophobia, and other diseases. In 1888, the Pasteur institute was formally opened at Paris for the cure or prevention of hydrophobia. He received many honors, both at home and from learned societies all over the world. He died Sept. 28, 1895. See *Louis Pasteur; His Life and Labors* (1885), translated by Lady Hamilton.



M. LOUIS PASTEUR.

Patago'nia, the most southern country of South America, extends south from the Argentine republic 1,000 miles to the straits of Magellan, which separate it from Terra del Fuego. It is about 480 miles wide, has an area of about 235,550 square miles (only a fifth of this area is in Chile), and a population of about 20,000. The Andes divide the country into two parts, the eastern area of which is occupied by the Argentine republic, and the western, what little there is of it, by Chile. Hence, to-day, Patagonia is but a geographical term. The western portion is rugged and mountainous, with islands and cliffs along the Pacific coast, which give it a wild outline. The mountains are not high, but some volcanoes are notable. Minchinmavida, 8,000 feet; Corcovado, 7,510; Monte San Valentin, 12,697; and Fitzroy, 7,120, are the chief. The strip of shore along the Pacific from the Andes is so narrow that there are no rivers longer than 13 miles.

The temperature varies from 50° to 33°, summer and winter, and is very damp. Coal is mined at Punta-Arenas, where Chile has a colony and penal settlement. Eastern Patagonia is not so desolate, but has high plains in some places covered by grass, forests, and shrubs, yet along the Atlantic coast everything is wild. The rivers here are the Negro, Chubut, Deseado, Chico, Santa Cruz, and Gallegos, all rising in the Andes. Some horses and cattle are raised, and wild fowl and animals are found in some regions. The inhabitants are Indians, almost a race by themselves, who are tall and straight, very hardy and strong, and muscularly developed. They make saddles, bridles, stirrups and lassoes, and speak a language peculiar to themselves. Some Europeans are found at the settlements at Patagones, on the Chubut and the Santa Cruz. Magellan sailed along the entire coast, in 1520, and the great plain was explored by De Isla in 1535. De Gambo founded Spanish settlements in 1579 and 1580, and Drake's voyages were followed by researches by Davis, Wallace, Falkner, King, Fitzroy, Darwin, Musters, and others. Since 1870, Argentine explorers have been going over the country. See works on Patagonia by Falkner, Snow, and Musters.

Patapsco River, a river of Maryland, flowing into Chesapeake bay, 14 miles below Baltimore. It is 80 miles long, and admits large vessels as far as Baltimore.

Patents, a term used to indicate the privilege granted by a government to an inventor, of the exclusive right to his invention for a term of years. The royal grant in England was made by letters-patent or open letters, called so because they were not sealed. The system of giving patents is common in Europe and the United States, though Switzerland and Holland have no patent laws, and Prussia does not favor them. The United States patent office is a branch of the department of the interior, and has its records, models, and drawings at Washington. The first law of patents was passed in 1790, and the present law in 1870. Any invention, both new and useful, can receive a patent. It is necessary only that it should be new in the United States, its previous use in foreign countries not preventing a patent. Any person who is the first inventor of anything that admits of a patent can obtain one, whether a resident of the country or a foreigner. The patents are given for seventeen years and cannot be renewed. There are about 30,000 applications for patents every year in America, and the patent office is a very interesting place, with its thousands of models of most of the inventions of this inventive age. For the year ending June 30, 1899, there were 35,352 applications for patents in the United States patent office, Washington, D. C., and 23,550 patents

granted. The number that expired was 16,670. See *Law of Patents*, by Edmunds; and *Law of Patents*, by Robinson.

Pat'erson, a city of New Jersey, 15 miles from New York city, is situated on the Passaic river. The river curves around three sides of the city, and has a fall of 50 feet, which gives the fine water-power used in the many manufactures of the place. Its principal manufactures are silk goods and locomotives, with cotton and paper mills, factories of carpets, shawls, wire, bagging, etc. There are over a hundred silk factories, making ribbons, handkerchiefs, veils, scarfs, fringes, dress-silks, and sewing silk, giving to the city the name of the "Lyons of America." Population 105,171.

Pat'erson, William, founder of the Bank of England, was born in Dumfriesshire, Scotland, in April, 1658. He went to London, to escape, it is thought, the persecution of the Covenanters, and afterward to the Bahama islands, where he formed a scheme for a free commonwealth in Darien, known as the Darien Scheme. He made a fortune by trade in London, and planned the Bank of England, being one of its first directors. He obtained an act of the Scottish parliament, in 1695, forming the Darien company, roused the whole nation to favor his plan, and sailed with the expedition, returning, in 1699, a ruined man. In 1715, he was granted $91,205 by the government in compensation for his losses. He was active in accomplishing the union of England and Scotland. He died Jan. 22, 1719. See *Life*, by Bannister.

Pat'more, Coventry Kearsey Deighton, an English poet, was born in Essex, England, July 23, 1823, and died in Hampshire, England, Nov. 26, 1896. His first poems were published in 1844. For about twenty years he was one of the librarians of the British Museum. His best-known work is *The Angel in the House* — a poem in four parts — "The Betrothal," and "The Espousals," "Faithful for Ever," and "The Victories of Love." It has been very popular, and several new and revised editions have been published. He also edited *The Children's Garland*, and *The Autobiography of Barry Cornwall.*

Pat'mos, a small rocky island in the Ægean sea, now called Patino. It is known as the place of exile of the apostle John, and where, tradition says, he saw the visions recorded in the Book of Revelation. The monastery of "John the Divine," built in 1088, stands on a mountain in the island. The island belongs to Turkey, and is inhabited by about 4,000 Greeks, who live mostly by fishing for sponges.

Pat'na, the fifteenth city of British India, is situated in Bengal, on the river Ganges. It stretches for nine miles along the river, but has narrow streets and poor houses. The government opium factories, Patna college, Mosque of Sher Shah, a Catholic church, and a Mohammedan college, are the principal buildings. Its situation at the junction of three great rivers, the Ganges, Gandak, and Son, gives it a large trade. It exports oil seeds, cocoanuts, salt, spices, cotton, and tobacco. Patna was founded probably about 600 B. C. In 1763, it was the scene of a massacre of British prisoners, and of a mutiny in 1857. Population 170,654.

Pa'ton, John Gibson, a Scottish missionary, was born in Dumfriesshire, Scotland, May 24, 1824. He labored first as a city missionary at Glasgow, and then went to the New Hebrides, working first among the cannibal natives of Tanna. After four years the opposition of the natives forced him to leave the island. His great work was done on the island of Aniwa, where he lived for twenty years, and saw the whole population become Christians. The story of his missionary life, edited by his brother, and published in a Chicago edition in 1892, is one of the most thrilling in missionary literature.

Pa'ton, Sir Noel, a British painter, was born at Dunfermline, Scotland, Dec. 13, 1821. He studied his art at the Royal academy, London. His pictures of *Christ Bearing the Cross*, and *Reconciliation of Oberon and Titania*, together gained a prize of $1,500. Scenes from fairyland and legend, and religious allegory, have made his work familiar and have been often engraved. Among his works are *Home from the Crimea*, *Luther at Erfurt*, *The Fairy Raid*, *Gethsemane*, *Christ and Mary at the Sepulchre*, *The Man of Sorrows*, and *Thy Will be Done.* He is known also by his illustrations of the *Lays of the Scottish Cavaliers* and *The Ancient Mariner.* He has also written two volumes of poems.

Pa'triarch, Greek, the head of the Greek church. The name patriarch was given to the bishops of some of the larger divisions of "sees" of the Catholic church, and at the time of the council of Nice, there were three patriarchs, those of Antioch, Alexandria, and Rome. When the seat of empire was changed to Constantinople, its bishop was made a patriarch, and was superior to those of Antioch and Alexandria, and second only to the prelate at Rome. The Greek church arose from a division in the Catholic church, resulting from the contests between the patriarchs of Rome and Constantinople.

Pat'rick, Saint, the apostle and patron saint of Ireland, was a distinguished missionary of the 5th century. He is thought to have been born about 392. When a boy he was taken by pirates and sold to an Irish chief, who lived near the town of Broughshane, in the county of Antrim. He escaped after six years and went to France, becoming a monk. In 432, he went as a missionary to Ireland, landing at the town of Wicklow. He sailed north, hoping to convert his old master, who

killed himself, however, when he heard of Patrick's approach. A chief, named Dichu, who was converted by him, gave him his first Christian church, called Sabhall or Saul, meaning "the barn," and it is still a church bearing the same name. He is said to have founded 365 churches, baptized 12,000 people, and consecrated 450 bishops. The date of his death is in dispute, the latest period given, 470, making him about 100 years old. The only certain writings of his are his *Confessions*, and a letter written to a man named Coroticus, thought to be a Welsh chieftain, or by others a pirate who had carried off many of St. Patrick's Irish converts. See *Tri-partite Life of St. Patrick*, by Stokes.

Patt'eson, John Coleridge, an English missionary bishop, was born at London, April 1, 1827. His father was Sir John Patteson, an English judge, and his mother was a niece of Coleridge. He studied at Oxford, and became curate of Alfington in Devonshire. In 1855, he devoted himself to missionary work and sailed for New Zealand. He spent his life laboring among the Melanesian islands in the Pacific, and in 1861 was made bishop of Melanesia. He was greatly beloved by the islanders, whom he protected as far as he was able from the kidnappers of the slave trade, yet he fell a victim to their infamous traffic, being killed Sept. 16, 1871, by natives of Nukapu, one of the Santa Cruz islands, out of revenge, it is thought, for relatives carried away by the "slavers." See *Life*, by Yonge.

Patti, Adelina (*pat'ē, ad-ā-lē'nā*), a famous Italian opera singer, was born at Madrid, Feb. 19, 1843. When seven years old, she sang *Casta Diva* in New York, where her family were then living, and made her first appearance in opera in that city in 1859. Her first appearance at London in 1861 was as successful as were those in the United States, and there and at Paris and St. Petersburg, and wherever she has sung, she has been very popular and received with great enthusiasm. Her marriage to the Marquis de Caux ended in divorce, and in 1886 she married the tenor singer, Ernest Nicolini. Her Welsh home (Craig-y-nos) is near Swansea.

Patt'ison, Dora Wyndlow, known as "Sister Dora," the sister of Mark Pattison, was born at Hanxwell, in Yorkshire, England, Jan. 16, 1832. Against the wishes of her family, she began her life of labor for others as a teacher at Little Woolston, in 1861. In 1864, she joined a sisterhood, called the Good Samaritans, where she undertook the work of nursing. In hospital work her self-forgetfulness, patience, gentleness, and skill made her idolized by the rough men and women among whom she labored. The severest toil and the horrors of smallpox she braved with enthusiasm, and hundreds of the most depraved men and women were saved by her life of devotion. She died at Walsall, Dec. 24, 1878, a martyr to her work, and was followed to the grave by the whole town. A monument was built to her memory in 1886 by workingmen. See *Sister Dora*, by Margaret Lonsdale.

Patt'ison, Mark, an English writer and scholar, was born at Hornby, in Yorkshire, England, in 1813. He studied at Oxford and became a fellow of Lincoln college in 1839. His life was that of a scholar, and his standard was so high that his work largely suggests his power as a writer. He contributed articles to the *Quarterly*, the *Westminster*, and the *Saturday Review*, and wrote *Isaac Casaubon*, *Milton*, one of the best lives in the "English Men of Letters" series; edited Pope's *Essay on Man*, his *Satires and Epistles*, and the *Sonnets of Milton*. In 1861, he was made rector of Lincoln college. He died at Harrowgate, July 30, 1884. See *Memoirs*, by himself.

Pat'ton, Francis Landey, an American clergyman and educator, was born at Warwick Parish, Bermuda, Jan. 22, 1843, and educated at Knox college, Toronto. He graduated at Princeton Theological seminary in 1865. He received the degree of D.D. from Yale in 1888, and that of LL.D. from Harvard in 1889. He was ordained to the Presbyterian ministry June 1, 1865, and was pastor in New York, Nyack, and Brooklyn in succession. He became a professor in what is now McCormick Theological seminary in 1872, where he remained nine years. He was elected moderator of the general assembly in 1878. In 1881, he was elected to a chair in Princeton Theological seminary, and in 1888 to the presidency of the college of New Jersey, now the University of Princeton.

REV. DR. PATTON.

Paul was the name of five popes, of whom Paul I. and Paul II. were unimportant.

Paul III. (Alexander Far'nese) was born in Tuscany in 1468, and elected pope in 1534. Though ambitious to advance his family, making cardinals of two grandsons while they were yet boys, he was, however, a wise ruler and surrounded himself with good cardinals. His "bull," or decree of excommunication against Henry VIII. of England, issued in 1538, and the one forming the order of the Jesuits, are the most important edicts of his reign. He supported Charles V. in his struggles against the Protestant League in Germany. He died suddenly, Nov. 10, 1549. See *Lives of the Popes*, by Ranke.

Paul IV. (**Giovanni** [*gē-ō-van'nē*] **Pietro** [*pē-ā'trō*] **Caraffa**) was born at Naples in 1476. He became pope in 1555, when in his seventy-ninth year. He was strict in the punishment of heresy, establishing a censorship to examine books, and was the first to issue a list of prohibited books. He was thoughtful of the poor and just in his government, even banishing his own nephews from Rome on account of their evil conduct. He became involved in quarrels with the Emperor Ferdinand, with Philip II. of Spain, and Cosmo, grandduke of Tuscany, and his strength giving way he died Aug. 18, 1559. See *Lives of the Popes*, by Ranke.

Paul V. (**Camil'lo Bor'ghese**) was born at Rome, in 1552. He was "nuncio," or representative of the Catholic church at the Spanish court, and a cardinal under Pope Clement VIII. In 1605, he became pope. His rule was vigorous and made memorable by his long conflict with Venice, on the claim that the clergy should not be liable to trial by the common courts. The dispute was settled in 1607 by the help of Henry IV. of France. He improved Rome by new public works, the preservation of antiquities, the establishing and renewing of museums and libraries and of charitable institutions. He died Jan. 28, 1621. See *Paul the Pope and Paul the Friar*, by Trollope.

Paul, Saint (originally "Saul"), the great "apostle of the Gentiles," was born about 3 A. D., in Tarsus, according to some, but according to St. Jerome, in Giscala, in Cilicia, and taken to Tarsus in his infancy. He was a Jew of the tribe of Benjamin, and received the name Saul, changed afterward to Paul. He was in some way also a Roman citizen. He studied at Jerusalem, in the famous school of Gamaliel, and makes his first appearance in history as a persecutor of the new sect of Christians. After the persecution at Jerusalem, he set out for Damascus on the same errand. His conversion from a persecuting Pharisee to an apostle of the new religion, according to the account given in Acts, was effected by a blinding vision, which outshone the Syrian sun, and which, he affirms, was a vision of the Jesus whom he persecuted. Cured of his temporary blindness, he spent three years in retirement in Arabia, and then began at Damascus his wonderful life of labor and suffering. He and Barnabas were the first foreign missionaries of the Christian church, sailing to Cyprus, to Perga, and to Lystra, where Paul was stoned and left for dead. He sided with the Gentile converts in their struggle to free themselves from the burdens of the Jewish ceremonies, and thus won the first battle of religious liberty in the Christian church. On his second missionary journey he preached from the areopagus (Mars Hill), at Athens, to the seekers of the "unknown God," and founded the churches of Philippi, Corinth, and Thessalonica. During his third missionary journey through Galatia, Phrygia, Macedonia, and the Grecian islands, he wrote his most important group of epistles. On his fifth visit to Jerusalem, he was mobbed by the Jews, who charged him with taking a Gentile into the temple, but, claiming protection as a Roman citizen, he was sent to Felix, the Roman governor, at Cæsarea, who kept him two years in prison. Tried again by Festus, he appealed to Cæsar, and was sent bound to Rome, suffering shipwreck on the journey. Two years were spent in prison with a guard of soldiers, but he carried on his work of preaching, making converts among his guards and even in Cæsar's household. He seems to have been acquitted at Rome, and there are traces of his probable visits to Colossæ, Crete, and Nicopolis, his trial and imprisonment at Ephesus, and his second journey to Rome. His death, under Nero, probably by beheading, as he was a Roman citizen, is taught by Christian tradition; but there is nothing definite known of this. Thirteen epistles were written by him, and are found in the New Testament, some of them being letters to churches, and some to friends, in which are found those truths which make Paul the chief founder of Christian theology. "He has earned the admiration of all Christian ages, because he was great enough to overcome the prejudices of his nation and sect, and to be cursed in his own age as a renegade Jew." See *Life and Epistles of St. Paul*, by Conybeare and Howson; *Life and Work of St. Paul*, by Dean Farrar.

Pauncefote (*pŭns'fŭt*), **Julian**, Lord, an English diplomat, was born at Munich, Bavaria, Sept. 13, 1828. He was educated at Paris, Geneva, and Marlborough college, England. He became a barrister of the Inner Temple in 1852; secretary of state for the colonies in 1866; chief-justice of the Leeward islands in 1874; under-secretary of state for foreign affairs, 1882; delegate for drawing up an act relative to the navigation of the Suez canal, 1885; and minister plenipotentiary to the United States, in 1889. He has received the grand cross of St. Michael and St. George, and the grand cross of the Order of the Bath. He was a member of the International Peace conference at The Hague in 1899, and was afterward raised to the peerage. His office in Washington, on account of his distinguished services, was raised from that of a minister to that of an ambassador in 1893. He was created a baron in 1899. Died May 24, 1902.

Pausanias (*paw-sā'nē-as*), a Spartan general and nephew of Leonidas. He was in command of the Greeks in the battle of Platæa, 479 B. C., in which the Persians were defeated. He compelled the Thebans to give up the chiefs of the Persian party to him for punishment, and captured Cyprus and Byzantium. His ambition now made him become

a traitor to his country, and he entered into secret negotiations with Xerxes, hoping to rule Greece under him. He was recalled to Sparta and tried, but acquitted because of his former services to the state. A second time he renewed his intrigues and a second time was called to account by the Spartans, and again escaped punishment. His third effort to stir up the Helots to rebellion was betrayed by one of them, and Pausanias took refuge in a temple. The people blocked up the gate of the temple with heaps of stones, leaving him to die of hunger, his mother placing the first stone.

Pave'ment, a covering of stone, brick, wood, cement, or asphalt, placed on a street or road to give a hard and easier surface for travel. It is to be distinguished from the gravel and stone coating put on country roads. Pavements are mostly used in cities where the travel is large. The first thing necessary in a pavement is a good foundation. The work on the foundation depends largely upon the character of the soil and whether it is well drained or not. The best foundation is a layer of concrete, varying from six inches to twelve inches thick, according to the loads to be sustained. Of the materials used for pavement, wood is in most parts of the United States the cheapest, but it is not durable, as it rots, even when creosoted and coated with tar. Stone was formerly used in the form of small round boulders, called cobble stones, but this made such a rough pavement that it is seldom used now. Small rectangular blocks of granite or trap rock are often used. About 1880, brick pavements were introduced in the smaller cities of Illinois and Ohio, and brick is now used very extensively in different parts of the country. When the special pavement bricks of good quality are used and put on a good concrete foundation, it is one of the most satisfactory pavements for ordinary traffic, being both fairly durable and easy to travel on. Asphalt is a bituminous rock found in Trinidad, in parts of California, and other places. When heated and mixed with sand it can be used to coat a foundation on a street, and hardens into a smooth, elastic, and durable pavement for residence streets. It is used extensively in Washington and Buffalo in the United States, and in Berlin and Paris in Europe. Asphalt and brick have the advantage of medium cost and of being easily cleaned. Stone is the most durable, though it is also the most costly.

Pavia (*pä-vē'ä*), a city of northern Italy, on the Ticino river, 21 miles south of Milan. It was called the "city of a hundred towers," from its numerous square towers used as prisons, two of which, about 190 feet in height, are still standing. Its oldest church, that of St. Michael, mentioned as early as 661, is the place where the early kings of Italy were crowned; restored in 1863–76, it is now called the royal basilica. The cathedral, begun in 1488, but never finished, contains the tomb of Boëtius, and in a chapel connected with it are the ashes of St. Augustine. Near the city is the monastery of Certosa, which was built by the first duke of Milan, its church being one of the most beautiful of that era. The university, which dates from 1300, and thought to have been founded by Charlemagne, and famous in the middle ages, has now over 1,300 students, with 53 instructors, and a library of 200,000 volumes. Pavia was founded by the Gauls, sacked by Attila in 453, and by Odoacer in 476. Under the Lombards, as their capital, it became the chief city of Italy. It is memorable for the battle between the French army and the emperor's troops, fought Feb. 24, 1525, in which Francis I. of France was taken prisoner. The city was taken by the French in 1527, and in 1796 by Napoleon, and belonged to Austria after the peace of 1814. Since 1859 it has been a part of the kingdom of Italy. Population 38,722.

Pawnees (*pa-nēz'*), a tribe of American Indians, who lived on the Platte river and its branches, in Nebraska. They were divided into four bands, and were always engaged in fighting the Sioux, but have been friendly to white settlers. In 1833, and again in 1857, they gave up parts of their lands to the United States, which, however, did not protect them from the Sioux, by whom they were slaughtered, until the remnant of the tribe removed to the Indian territory in 1876. See *Pawnee Hero Stories and Folk-Tales*, by Grinnell.

Paw-Paw, called also pa-paw and custard apple, is a small tree, or shrub, found in the central and southern parts of the United States. The fruit looks somewhat like a ripe cucumber or banana, with a yellow skin, turning brown as it becomes very ripe. The flesh is soft, about the color of custard, very sweet and with large, flat, black seeds, larger than those of a watermelon. It is not often found in markets. A variety which grows in South America has a larger fruit, which is cooked with sugar and lemon before eating. Its leaves are used instead of soap, and its juice preserves meat.

Pawtuck'et, a city in Providence county, R. I., is situate on the Pawtucket river, four miles north of Providence. The river has a fall of 50 feet, which makes the city one of manufactures. It was the site in 1790 of the first cotton factory in the United States, and was for forty years the most important manufacturing town in the country. It has now cotton, woolen, haircloth, and thread factories, calico-printing works, bleaching and dyeing establishments, etc. Pawtucket was settled about 1655, formed a part of Bristol county, Conn., until 1861, and became a city in 1886. Population 39,231.

Pax'ton, Sir Joseph, an English architect, was born in Bedfordshire, England, Aug. 3, 1801. He began life as a gardener in the service of the duke of Devonshire. His care of the great glass conservatories of the duke at Chatsworth suggested to him the use of glass and iron for the building of the great exhibition of 1851. It was the first time these materials had been used for so large a building, and the effect delighted all who saw it. Paxton was knighted for his successful design. He afterward designed the Crystal Palace at Sydenham, and superintended its building, laid out the terraces, and planned the gardens. He has published the *Cottage Calendar*, which was very popular; *Paxton's Flower Garden*, and edited the *Botanical Magazine*, and a *Pocket Botanical Dictionary*. He sat in parliament for nine years, and died at Sydenham, near London, June 8, 1865.

Payne, John Howard, an American dramatist, was born at New York, June 9, 1792. His first appearance as an actor was in that city in 1809. He was a successful actor for thirty years, and also wrote several plays, of which the best known are *Brutus*, *Charles II.*, and *Clari*. The song, *Home, Sweet Home*, for which he is remembered, is in *Clari*, which was produced as an opera. The author of *Home, Sweet Home*, had no home for the last forty years of his life, and died in a foreign land, having been appointed American consul at Tunis, where he died April 10, 1852. His remains were brought to America, and buried at Washington in 1883. See *Life and Poems*, edited by Harrison; and *J. H. Payne*, by Brainard.

Pay'son, Edward, an American clergyman, was born at Rindge, N. H., July 25, 1783. He graduated at Harvard college, and after studying theology, became pastor of a Congregational church at Portland, Me., where he remained until his death, Oct. 22, 1827. He was known for his earnest piety, and was among the most prominent ministers of the period, though dying at the early age of forty-four. His publications are made up of his sermons and occasional discourses. See *Memoir*, by Cummings.

Pea'body, Andrew Preston, an American (Unitarian) clergyman, was born at Beverly, Mass., March 9, 1811. He graduated at Harvard college in 1826, studied theology, and was pastor for seventeen years of a church at Portsmouth, N. H. He was then appointed preacher and professor of Christian morals in Harvard university. For nine years he was editor of the *North American Review*, a frequent contributor to periodicals, and a well-known lecturer. He published *Lectures on Christian Doctrine*, *Christian Consolations*, *Manual of Moral Philosophy*, *Christianity and Science*, and *Christian Belief and Life*, besides over 100 sermons, tracts, and pamphlets. He died March 10, 1893.

Pea'body, Elizabeth Palmer, an American educator, was born at Billerica, Mass., near Boston, May 16, 1804. She was a sister of Mrs. Nathaniel Hawthorne and Mrs. Horace Mann. She taught in the celebrated school of Bronson Alcott, and was one of the first to introduce the methods of Froebel into American schools and to use object lessons in teaching. She was the first to establish a kindergarten in America. She published many works of an educational character, especially upon her favorite theme. Among her best-known works are *The Kindergarten in Italy*, *Letters to Kindergartners*, *Guide to the Kindergarten*, etc. She died at Jamaica Plain, Mass., Jan. 3, 1894.

Pea'body, George, an American merchant and banker, was born at South Danvers, Mass., Feb. 18, 1795. When eleven years old, he began his business life in a grocery, was next a clerk in Thetford, Vt., and afterward partner of a dry-goods house in Georgetown, D. C. This business was removed to Baltimore in 1815, and had branches at Philadelphia and New York in 1822. In 1837, he settled in London, starting a banking house, and making a large fortune, partly by investing heavily in government bonds during the Civil war. In 1851, he supplied the money needed to fit up the American department of the Great Exhibition at London. His fame rests not on his wealth, but on his benevolence, as he gave away during his lifetime five and a half million dollars. Among these gifts were $10,000 to the Grinnell expedition to the North pole, under Dr. Kane; $200,000 to found the Peabody institute at South Danvers; $50,000 to an institution at North Danvers; $1,000,000 to the Peabody institute at Baltimore; $25,000 each to Phillips academy, Andover, and Kenyon college, at Gambier, O.; $150,000 each to Harvard and Yale, and $3,500,000 as a fund for educational purposes in the south. He also spent $2,500,000 in building model homes for the poor of London, of which in 1889 there were eighteen groups in different parts of the city, accommodating 20,000 people, while the rents and interest brought in $150,000 net profit. He was offered the title of baron by Queen Victoria, but declined, asking only for "a letter from the queen, which I may carry to America and deposit as a memorial of one of her most faithful sons." The letter was given with the queen's portrait, and both are deposited in the Peabody institute, at his native town of South Danvers, now called Peabody, in honor of its illustrious citizen. He died at London, Nov. 4, 1869, his body being sent to America in an English warship. There are statues of Peabody at London and Baltimore. See *Life*, by Hanaford, and *Beneficent and Useful Lives*, by Cochrane.

Peace River, a large river of Canada, rises in British Columbia in the Rocky mountains, flowing northeast to Lake Athabasca, where

it joins the Slave river by five mouths. The delta thus formed is the most fertile part of the country. The river is 1,100 miles long, but is interrupted by rapids.

Peach, the well-known fruit of a species of Prunus (*P. Persica*) which is native to China. A well-known variety of peach is nectarine. It has long been cultivated and very many varieties have been produced. They are extensively cultivated in the warmer parts of Asia as well as in certain regions of the United States. The pericarp, that is, the transformed ovary, ripens into an outer fleshy layer and an inner stony one. Cultivation has done much in increasing the thickness of the pulpy layer. Peaches are cultivated in the United States most extensively in Maryland, Delaware, New Jersey, Pennsylvania, Michigan, and on the Pacific slope. Associated with the peach, in the genus Prunus, are the almond, plum, apricot, and cherry.

Pea'cock, a bird belonging to the pheasant family, and conspicuous for the beautiful train of the male. This train is not composed of the tail feathers, but of long feathers which overlie those of the tail, and are called tail-coverts. These, together with the tail, are capable of being erected. The peacock is a native of India and Ceylon, and is plentiful there in the forests and jungles. Their diet is varied, consisting of worms, reptiles, grain, flesh, fish, etc. These birds have been naturalized in many parts of the world. The plumage of the male combines blue, green, gold, and bronze tints. The tail-coverts are especially magnificent, with bright-colored eye-spots, and can be spread into the form of a huge fan. The blue tint is so characteristic that it has given rise to the name peacock-blue. The female is brownish and without showy tail-coverts. At first, both are alike in plumage, but the male begins to acquire gorgeous tints, and is in perfect plumage at the end of about three years. By the ancients, the peacock was called the bird of Juno.

Peale, Charles Willson, an American portrait-painter, was born at Chestertown, Md., April 16, 1741. His art education he received from a German painter and from Copley. His paintings are chiefly portraits, for which he was celebrated, among them being several of Washington. In 1785, he formed a collection of natural curiosities, founding at Philadelphia Peale's Museum. During the Revolutionary war, he commanded a company of soldiers at Trenton and at Germantown. He died at Philadelphia, Feb. 22, 1827.

Peale, Rem'brandt, an American painter, the son of Charles W. Peale, was born in Pennsylvania, Feb. 22, 1778. He painted portraits for awhile at Charleston, S. C., and then went to England and France to study his art. Besides his many portraits, he painted several historical pictures, among them the well-known *Roman Daughter;* and the *Court of Death, Notes on Italy,* and *Portfolio of an Artist,* were published by him. He died at Philadelphia, Oct. 3, 1860.

Pea'nut, the pod of species of *Arachis,* a genus which belongs to the pea family. The common species in the south is *A. hypogæa,* from South America. After flowering, the forming pod is protruded on a rigid stalk and is pushed into the soil, where it ripens its characteristic oblong, reticulated, coriaceous fruit, which contains one to three edible seeds. In the south peanuts are more commonly known as "goobers" or "goober peas."

Pear, a species of Pirus (*P. communis*) cultivated from Europe, a member of the rose family. It is associated in the same genus with the apple and quince. The peculiarity of the fruit is that the flesh consists of the transformed cup, upon whose rim the sepals, petals, and stamens arise. It is often spoken of as the calyx, but it represents a support common to all three of the outer floral organs. This type of fruit, with flesh developed from the part of the flower which surrounds the ovary, is called a "pome." The ripened ovary is represented by the "core." The pear has been cultivated from the most ancient times, and has reached a high degree of perfection. Almost innumerable varieties have been produced, each with its appropriate name. In a wild or neglected state, the branches are more or less thorny, but under cultivation the thorns disappear.

Pearl, one of the gems found in certain sea and fresh-water shells. Shells are generally lined by the animals inhabiting them with a material which gives them a smooth surface. It is laid in thin, partly transparent plates, which produce a beautiful play of colors. This lining is called mother-of-pearl, or "nacre." On opening the shells, there is sometimes found rounded portions of this nacre, which have been formed by throwing around a grain of sand, or a minute vegetable or animal growth, layers of this lining material. These are the pearls used in trade and worn as ornaments. They vary very much in size, those about as large as a pea being the best. The largest one known is two inches long and four inches around. The smallest are called seed pearls. The value depends upon the size, shape, color, and freedom from imperfections. The round ones are the best, the button-shaped next, and the drop or pear-shaped last. Pearls, when perfectly round and of extraordinary beauty, sell for large sums; the single pearl which Cleopatra is said to have dissolved and swallowed, was valued at over $400,000. The finest pearls are found close to the lips of the shell, or in the soft part of the oyster near the hinge. The largest pearl fishery in America is that of Lower California, from which come the largest and finest black pearls in the

market. The most famous pearls are from the east, especially from the Persian gulf and from Ceylon.

In the Ceylon fishery the fishing season lasts from four to six weeks. Each boat has a crew of thirteen men and ten divers, five of whom rest while the other five are diving. The work has to be done very rapidly, as the best divers cannot stay longer than eighty seconds in the water. When a boatload of oysters has been got, the cargo is landed and piled on the shore to rot, so that the pearls can be easily found. When washing out the dead animals, a close watch is kept for loose pearls, which are always the finest, while those attached to the shells are removed by pinchers or a hammer. In 1889, at Ceylon, in twenty-two days, fifty divers brought up 11,000,000 oysters. River pearls are found in fresh-water shells in Scotland, Wales, Ireland, Russia, Germany, Canada, and the United States and China. The chief river pearl fishery in the United States is in the Little Miami, in Ohio. The lining of the shells, or mother-of-pearl, is used largely in making buttons, knife and fork handles, and inlaid work on furniture. See *Gems and Precious Stones of North America*, by Kunz, and *Pearls and Pearling Life*, by Streeter.

Pearl River, a river in Mississippi, rising in the center of the state and flowing south into the gulf of Mexico. It forms a part of the boundary between Louisiana and Mississippi. The river is 300 miles long and is obstructed by sandbars and driftwood.

Pear'sons, Daniel Kimball, an American philanthropist, was born at Bedford, Vt., April 14, 1820. He graduated in medicine at Woodstock, Vt., and practiced in Chickopee, Mass., until 1857. He became a farmer in Ogle county, Ill., in 1857, but in 1860 he removed to Chicago, where he rapidly accumulated a large fortune in real estate. For some years he served the city as alderman and assisted in managing its financial budgets. He is best known through his large gifts to educational and eleemosynary institutions, the Presbyterian hospital of Chicago, and the Chicago Theological seminary being especially favored. There are few of the smaller colleges to which he has not given from $25,000 to $250,000, and his gifts run well up into the millions. He lives at Hinsdale, Illinois.

Pea'ry, Lieut. **Robert Edwin,** an American naval officer and explorer, was born at Cresson, Pa., May 6, 1856, and educated at Bowdoin college, where he graduated in 1877. He entered the United States navy as a civil engineer, Oct. 26, 1881. For several years succeeding he was engaged in surveys connected with the Nicaragua canal, but in 1886 made a trip along the coasts of Greenland in the interests of the Academy of Natural Sciences, Philadelphia. He discovered and named Melville land and Heilprin land. For his discoveries upon this trip he received medals both from American and English geographical societies. In later years, he has been almost solely engaged in Arctic explorations or in preparations for the same. In one of his Arctic winters he was accompanied by his wife, Mrs. Josephine (Diebitsch) Peary. Lieutenant Peary wrote *Northward Over the Great Ice-Cape*, and his wife wrote *My Arctic Journal*.

Peas'ants' War, an insurrection of the German peasantry, which broke out, in 1524, against the oppressions they were suffering at the hands of the nobility and clergy. For a short time it seemed that the peasants would carry everything before them, as they defeated the army sent against them by the Archduke Ferdinand, under the command of Von Waldburg; and a number of princes and knights concluded treaties with them, conceding their principal demands. But, unfortunately, the conduct of the insurgents did not accord with the moderation of their demands, as they destroyed convents and castles (more than 1,000 in all), murdered, pillaged, and committed other great excesses. In May and June, 1525, they sustained a number of crushing defeats, and were soon after completely overthrown. Multitudes were hanged in the streets, and others were put to death with the most terrible tortures. It is estimated that 150,000 lives were lost during the short period of the Peasants' war.

Peat, a substance formed by the decomposition of plants in marshes and morasses; it is also sometimes described as a kind of soil formed by the remains of mosses and other marsh plants. The remains of plants are often so well preserved in peat that their species can be easily determined; but in the northern parts of the world it is chiefly formed from certain kinds or species of bog-moss. These mosses grow in very wet places, and throw out new shoots from their upper parts, while their lower parts are decaying and forming peat, so that shallow pools are gradually changed into bogs. Moist peat is a decided and powerful antiseptic, as is shown in the preservation not only of ancient trees, leaves, and fruits, but even of animal bodies. It is claimed that in some instances human bodies have been found preserved in peat after the lapse of centuries. Peat is formed only in the colder regions of the world, as in warmer regions vegetable substances decompose too rapidly. Peat is largely used for fuel in Holland, Denmark, Scotland, Ireland, and other European countries, and efforts have been made to bring it into more general use by compressing its bulk, but although numerous machines have been invented and patented for this purpose, the enterprise has not yet proved a complete success.

Peb'ble, a small, round, water-worn stone of any kind, but with jewelers sometimes

agates—agates being frequently found as loose pebbles in streams, those of Scotland being designated as *Scotch pebbles*. Deposits of pebbles occur among the rocks of all periods; but the older pebbles are seldom loose; they are generally cemented together by iron oxide, lime, or silica, forming a pudding-stone of greater or less hardness.

Pec'cary, a small pig-like animal inhabiting the forests of the New World. There are two species, the more northern, or collared peccary, occurs as far north as the Red river in Arkansas, and ranges south to the Rio Negro of Patagonia. This species is about three feet long; it occurs singly or in small herds of eight or ten, and is comparatively harmless. The white-lipped peccary is about forty inches long, and, like the collared peccary, is covered with thick, bristly hair. Its range is between Paraguay on the south and British Honduras on the north. They occur in herds of fifty to one hundred or more, and are dangerous when excited. Both kinds live on roots, fruits, worms, and the like. In cultivated districts they are destructive to crops.

COLLARED PECCARY.

Pedagogics (*pĕd-a-gŏj'ĭks*). The term pedagogics as now used embraces the whole field of education, though formerly it was restricted to the formal phases of the subject, as school organization, methodology, and the philosophy of education.

There are certain sub-conscious forces always at work in the education of the youth as well as of the adult, which in a general way may be denominated his environments. These are the environments of the age as well as of the community. The movements and sentiments of the world at large often affect the youth in a profound manner. This is more true in these days of rapid transit and intercontinental telegraphic communication than formerly. Great economic, political, international, and social movements in any part of the globe quickly attract the attention of the reading youth, provoking more or less sympathetic discussion, with consequent enlightenment and enlargement of conceptions of the problems involved. Thus the world spirit of an age exercises influence in the education of the youth, particularly among civilized nations.

In like manner the institutions of one's own country and community, including every private and public interest which touches their lives, are active factors in the intellectual and moral development of the people. The community spirit, though influenced largely by the world spirit has a distinct and positive character of its own that in certain directions is often more potent than the formal educational machinery of the schoolroom. It affects the ideals, the language, the occupations, the tastes, the manners and customs of every one in such a way that he easily reveals his locality wherever he goes. The various institutions of civilization, the church, the home, the press, the scientific and professional associations, the political and fraternal organizations, the commercial and industrial unions, each of them making a more or less formal attempt at education in certain lines, conspire to educate the masses of the people of all classes and of all ages. The fact that these different forces are often antagonistic to each other does not in any way lessen their efficiency as educational factors.

It will readily be conceded that, however universal and effective these influences may be, at best they accomplish little in the way of a systematic development of the activities of the child. They serve rather to contribute a continuous stream of varied information, to stimulate interest, to shape sentiment and to influence conduct.

The systematic development of the activities of the child, which is the true end of formal education, can be accomplished only by the directing influence of an individual will; a will which sets up an ideal which the child is to realize and then proceeds in a methodical way to help it realize that ideal. Herein is found the specific function of the teacher. For this purpose the school is organized, equipped, and maintained. It anticipates the larger life of the community and of the adult by developing his activities so as to fit him for the wider sphere of action to which he is destined. It strives to give him that freedom in thought and action which will make him independent, self-reliant, and successful in the affairs of life.

All the activities of the child emanate from the will. The will performs a double function. It sets up ideals and then sets about to realize them. In childhood the imitative impulse is strong, and the child finds great satisfaction in taking its ideals from the concrete examples about it, imitating them with great facility. Thus it learns to walk, to talk, to do a thousand things. The ideational impulses are also active in the child and with the enlargement of its experience, under proper guidance, gradually displace the purely imitative impulses and enable the child to think and act more or less independently of the suggestions of his surroundings. Whereas his environments were molding him before, he now begins to mold his environments. This mutual reaction of the individual will and the community will, resulting in the individual will becoming the dominating power, cancels the further need for assistance from the teacher and the school.

It is the function of the teacher to encourage in every possible way the imitative or

realizing activities of the child, but it is even more important that he with great wisdom continually stimulate the exercise of the idealizing activities — perception, memory, imagination, judgment, thinking, reasoning. To this end a knowledge of the genesis, nature, and laws of development of the intellectual activities of the child is essential as a basis for successful teaching. The intimate relationship between the mental and bodily activities requires also a similar knowledge of physiology and hygiene. As the emotional and volitional life of the child gives vitality to both, the preparation of the teacher includes not only a comprehensive study of the child's physical and mental organism, but of the child in action as well; of the child at home, at his plays, at work, alone, with his fellows, in his moods, in his studies; of the normal and the abnormal child, of the child's motives, of the child in the different stages of his development and in the processes of transition from one stage to another.

With such an acquaintance with child nature, the teacher is able to enter upon a study of the underlying principles of education and of the methods by which it is to be accomplished. The following-named elementary books will prove of great value in studying the genesis, nature, function, and laws of the mental life of the child: *The Study of the Child*, Taylor; *The Mental Development of the Child*, Preyer; *Psychology and Psychic Culture*, Halleck; *Inductive Psychology*, Kirkpatrick; *Primer of Psychology*, Ladd; *The Study of Children*, Warner; *Thinking, Feeling, Doing*, Scripture; *Psychology in the Schoolroom*, Dexter and Garlic; *The Story of a Child*, Loti. See also *The Psychologic Foundations of Education*, Harris.

The nature of education appears only as one understands clearly the nature of the act of learning. The nature of the act of learning is apprehended only as one sees clearly the nature and function of the self-activity of the child. That self-activity, generically speaking, is its will. It manifests itself in feelings, cognitions, and external actions, embracing the whole range of the child's conscious life. It is incited to action by sense stimuli from within or from without the body and responds to them by making attempts to locate them in space and to discover their characteristics and relations. This effort, if successful, is called the act of learning. By it the child simply relates a present sensation or experience to a past experience, that is, connects them in the mind by virtue of their common elements and puts the new experience where it belongs. This process of transforming the new and strange into the familiar by associating, comparing, and identifying it with things already familiar, is the form which every act of learning takes and is called the apperceptive process. In this way we get the meaning of things. For an elaboration of the nature and function of the apperceptive process, see *Lange's Apperception*, De Garmo; *A Pot of Green Feathers*, Rooper; *The Study of the Child*, Taylor; *Herbartian Psychology Applied to Education*, Adams; *Talks to Teachers*, James; *Psychology*, Dewey; and almost any late work on mental science.

The act of learning in getting original knowledge may be accomplished, (*a*) by the observation of things, particularly of things in action, (*b*) by experimentation, (*c*) by means of the reasoning process. The first two may result in direct perception forming simple, or by apperception, complex mental pictures of objects. They also furnish the percepts, the images, the materials out of which the reasoning processes may elaborate general notions and principles, *induction*, or to which they may apply notions and principles already formed, *deduction*. Every notion is built up of elements derived through observation, experimentation, and reasoning. Hence the importance of cultivating habits of accuracy and many-sidedness in sense perception.

The reasoning process is the highest form of knowledge-getting and, properly exercised, continually reacts upon the other two, increasing their range and power. As a result, the growing child, at each step in his progress, is able to interpret many new experiences immediately, by simple apperception, which in a previous stage would have required even laborious reasoning.

The preparation for teaching has made great progress when the prospective teacher fully understands the details of the processes involved in the act of learning, for teaching is simply the art of stimulating and guiding the self-activity of the child to the economic and speedy accomplishment of that act. Here again appears the necessity for an intimate acquaintance with the nature and functions of the child's mental activities.

How may the teacher assist the child in the effort to learn?

As a prerequisite, it is necessary for him to discover the degree of his familiarity with the elements of the subject under consideration. If he has little or no acquaintance with it, the object should be presented to the child, and a variety of methods used to encourage him in the formation of a picture of it, and of its relations to other objects, its uses, etc. If an object is not available, the next means in order of desirability would be a model, a colored picture, a photograph, a drawing, and, lastly, a verbal description. Even though the object be at hand, the others will be found valuable, in the order given, to lead the child gradually away from the necessity of the object itself, to be able to produce a mental picture of it from its merest outline in chalk or pencil, or from a verbal description only. By means of the multitude of objects round about him, the teacher may stimulate the child's powers of observation to an almost unlimited degree.

If the child already has some acquaintance with the subject under consideration, or with its types, the teacher may help him to recognize that fact by assisting him to identify the common elements, and thus enable him the more easily and quickly to understand the new elements and form a familiar mental picture of the whole.

Should the child be familiar with some of the elements under consideration, and have sufficient ability to follow reasoning processes, the teacher may aid him by leading him carefully from one point to another until he gets its full meaning. In this way he may be taught how to trace the relations of part to the whole, of cause to effect, of identity and difference, etc.

These three attitudes or stages in which the child's mind may be, with reference to any subject, are called sense-perception, imagination, and the logical or thinking stage. As sense-perception is predominant in the early years of the child's life, that term is then applied in a general way to his method of getting knowledge, though the other two methods are rapidly coming into prominence. From six to twelve years of age, his picture-forming activities,—conception, memory, and imagination, make up a large part of his mental life. At about twelve, the power to reason abstractly is usually recognized as a strong factor in knowledge-getting, particularly if the child has been properly educated. The interdependence and interaction of these lower and higher activities in the act of learning demand quick discernment and wise adjustment on the part of the teacher to the pupil's needs. It is a great mistake to encourage the child to depend upon his lower activities, in an act of learning, when he might be using the higher.

While it is important that the child be trained to observe, investigate, and form his own ideas about the objects with which he comes in contact every day, his ability is greatly increased as he learns how to use books as aids in his efforts at knowledge-getting. It is important that books be introduced in such a way that the pupil will be constantly multiplying and enlarging his capacity to interpret his increasing range of experiences, and the problems which they involve. The act of learning as such, however important, should always be regarded by the teacher as but the process by which the self-activity of the child is developing. Each act in perception, in forming ideals, or in realizing them, reacts upon the self-activity, increasing its power and range proportionately at every step. This is the law of the reaction:—

That however objectively engaged the mind may be, the reaction upon the self-activity in exercise is the same as though it were acting directly upon itself, if that were possible.

These reactions in the act of learning, whether in forming or realizing ideals, result in habits which are always the test of mental capacity and executive skill. It is through their formation that all growth is attained, that power to solve the higher and the more complex problems of life is developed.

The importance of right methods of study, and of right methods of instruction, becomes more and more evident as this reactive effect of every act of the child is understood. For the purpose of educating the teacher properly for the responsible work of teaching, four general lines of procedure have been recognized:—

THE PHILOSOPHY OF EDUCATION.—This includes an inquiry into the fundamental principles underlying the process of knowledge-getting, the development of the self-activities, and the methods by which the teacher may co-operate with the child. The terms *theory of education*, *principles of education*, *psychology applied to education*, *institutes of education*, *psychologic foundations of education*, etc., designate similar inquiries. They all strive to discover the philosophic basis of method in education, and cover, in a general way, the nature, limits, processes, means, special elements, phases, physical culture, intellectual culture, will culture, ethical culture, æsthetic culture, and a variety of kindred problems.

The following treatises are among the most useful now published on general theoretical pedagogy: *The Philosophy of Education*, Rosenkranz; *A Manual of Pedagogics*, Putnam; *Lectures on Teaching*, Compayre; *The Philosophy of Teaching*, Tompkins; *Outlines of Pedagogics*, Rein; *Pedagogics of the Kindergarten*, Frœbel; *The Method of Recitation*, McMurry; *Theory and Practice of Teaching*, Page; *Education of the Central Nervous System*, Halleck; *Education as a Science*, Bain; *Education*, Spencer; *Lectures on Teaching*, Fitch; *Interest in its Relation to Pedagogy*, Ostermann, (translation by Shaw); *Contributions to the Science of Education*, Payne; *Education of Man*, Frœbel. The Transactions of the National Educational Association, *Barnard's American Journal of Education*, and many State Reports, contain mines of information on theoretical and practical pedagogy.

METHODOLOGY, or the art of applying educational principles in the teaching process, has called forth a great variety of treatises on special and general methods. They usually treat of the formal methods of arousing the child's interest, of presenting the subject-matter in the different stages of the child's development, of conducting the recitation, of cultivating the various physical and mental activities of the child, and of the essentials in conditions and means. Methodology usually includes more or less of a discussion of the principles involved in the methods presented. The following books treat the subject in an instructive and practical way: *Method in Education*, Roark; *School Management and Methods*, Baldwin; *School Management*, White; *Methods of Teaching*, Swett; *Talks*

on Teaching, Parker; *Hours with my Pupils*, Phelps.

School Organization and Management as a somewhat distinct problem calls for elaborate treatment. It embraces the plans of organization, the sources of revenue, the selection of school sites, the erection of school buildings, seating, ventilating, lighting, and sanitation; the courses of study, choice of textbooks, classification of pupils, preparation and examination of teachers, — the general supervision of the school, the authority of the teacher, the management of the classes, rules of conduct, modes of punishment, presentation of motives, relation of teacher and pupils, etc.

The student is referred to the following authorities for a general treatment of these problems: *School Economy*, Wickersham; *School Supervision*, Payne; *School Interests and Duties*, King; *School Management*, White; *School Management*, Kellogg; *Theory and Practice of Teaching*, Page; *Systems of Education*, Gill; *School Hygiene*, Kotelmann, (Bergstrom's translation).

The History of Education. — A liberal professional preparation for teaching is hardly possible without a comparative study of educational progress as shown in past and present educational systems. It may take either of two general forms, that of education as a whole or that of formal pedagogy in particular. If the former, the field includes a history of the growth of all branches of learning and of the various institutions of civilization in general; if the latter, it is limited to the development of educational doctrine and the growth of systems and methods. There are commonly recognized five great epochs in educational history: the Oriental, the Classical, Christian before the Reformation, the Reformation, and the Modern Epoch. Each epoch is rich in instructive material, throwing light upon nearly every problem which the teacher meets and helping him to a more comprehensive view of the methods by which they may be solved.

The following are among the standard texts on this subject: Compayre, Painter, Seeley, and Williams. See also Boone's *Education in the United States*, Swett's *American Public Schools*, Klem's *European Schools*, Quick's *Educational Reformers*, Laurie's *Rise and Early Constitution of Universities*, Lang's *Great Teachers of Four Centuries*, Browning's *Educational Theories*, Butler's *Great Educators*, Winship's *Great American Educators*, and the histories of education in the different states of the Union published by the bureau of education.

The methods of teaching as well as the subject matter must vary with the age and capacity of the pupil. In the earlier years, nature study supplies an abundance of material which may be used to introduce the elements of knowledge. The ability to correlate these elements in a systematic way and in the advancing grades gradually to differentiate them into the particular branches of knowledge developing from them, requires great skill on the part of the teacher.

The following brief survey of nature study and a few other subjects, together with suggestions for teaching them, will serve to illustrate scientific method.

Nature Study. — The environments of the child, as already explained, constantly stimulate sense perception and provoke inquiry. They are always arousing him to see and hear and smell and taste and touch. The satisfaction he gets in exercising his senses begets increasing desire to their further exercise and his ability to discriminate grows rapidly every day. Curiosity and wonder spur him to find out what he can about everything he meets. These experiences are his mental food as well as the means of his physical development. Parents usually pay too little regard to mental culture in the first five years of the child's life, little realizing its relation to the after-life, though his eagerness to know usually accumulates a great fund of child knowledge and even child skill before he enters school. These years powerfully affect his life habits of investigation, of thinking, of talking, of language, of acting.

On entering school he has already made considerable progress in getting acquainted with the animate and inanimate objects about him. He is usually bubbling over with interest in everything he meets, particularly with those things that give sense pleasure and strike him as strange and novel. His knowledge is already of things in nature as well as of things in the household and about his father's work. This knowledge furnishes a fine starting point for his school work and suggests the wisdom of continuing it on the very lines so well calculated to maintain and enlarge his interests and encourage him to study. Nature study, then, may rightly engross a large part of the course of study for the lower grades. It serves to introduce the elementary work in the other subjects usually included in the higher grades and thus provides for that gradual transition to their more abstract phases and their more complex problems which is demanded by all scientific method. The teacher should plan the nature work so that it not only extends the child's range of experiences, but anticipates in a logical way the deeper and broader inquiries which he is to make later.

While there should always be method and system on the side of the teacher, there should always be relative simplicity and variety on the side of the child. The material should be selected with a view to the continual exercise and development of the perceptive activities, of observation, of understanding, of memory, of judgment, and of language. There is abundant material in every locality for use in this study. The teacher's individuality and ingenuity will enable him to utilize the

children in gathering the material and the data for talks and studies. In the higher grades the inquiries should be exhaustive and should assume a more strictly scientific form.

In September or October there are many interesting and instructive features of plant life which furnish the material in sufficient variety for several lessons: the more common autumn fruits of the locality, wild and cultivated, with a study of their form, texture, flavor, name, and use, etc; the autumn leaves and flowers with a study of their form, color, etc.; the autumn seeds, their forms, methods of distribution by winds, by animals, by water, etc. The animal life of these months is full of interest for young and old. The birds which have summered in the locality are going south and others with strange plumage are coming in from the north on their way further south or to spend the winter here. Insects are gradually disappearing in a variety of ways, some going into winter quarters to appear in new forms in the spring, others hiding away in the trees, in the earth, or elsewhere, while countless multitudes deposit their eggs and die. The thickening of the coats of the wild and domestic animals should be carefully observed now and in the month following. Clouds, rain, dew, frost, changes in temperature, direction of the wind, etc., will interest the child here and every month in the year.

In November and December nature study finds ample outdoor range in discovering how the plants have prepared for winter, how the buds are sealed up, where the leaves have gone, what animals still remain in the locality and how they live, what the streams are doing, where the fish and other water animals have gone, what the farmers are doing, etc. They are also good months for studying further the collections of fruits, seeds, leaves, grasses, etc., made in other months. Why are the days so short now? Why is the sun so far north? Why are fruits and vegetables beginning to rise in price in the markets?

The weather is a fruitful theme during January, February, and March, but there is much also to engage attention in the lines mentioned for the preceding months. A simple study of the forms and modes of movement of domestic and of wild animals will make a few attractive lessons. These are good months for the study of the various forms of water, and for making simple experiments in light, heat, electricity, etc. Note also later on the signs of springtime in the growing length of the days, in the disappearance of frost and snow, in the swelling and opening of certain kinds of buds, in the flowing of the sap in the trees, in the appearance of an occasional last year's animal, in the song of the robin or the quick cry of the redbird, in the buzzing of venturesome bees, in the work about the house and the farm.

April, May, and June conspire to furnish a world of material to attract and interest childhood. The studies should include the germination of seeds, the unfolding of leaves, the opening of the flowers; the parts of the plant, of the leaves and of the flowers, etc.; the various animals that cover the earth and skim the air, the moulting of the birds, the metamorphosis of the grasshopper, the butterfly, the frog, the building of nests, the swarming of the bees, animal foods. They should also include all kinds of work about the farm and home and should keep the child in close touch with ploughing time and seed time, and harvest, with the pests the farmer fears, the friends he should protect, etc.

July and August, as well as a great part of June, are months in which the child is usually out of school, but if the teaching during the other months is successful, these months also will have much in experiences upon which he will find pleasure in drawing as school opens in September.

Nature study includes the various parts and functions of the child's body, as well as of animals in general, and should make the child acquainted with the conditions essential to good health and to the development of physical strength and skill. It also includes a study of the topography of the locality, the soil, the rocks, the mineral deposits, the springs and streams, together with the forces which have shaped and are shaping the land. Excursions to other localities will be invaluable in adding zest to every phase of the study.

Success in directing nature study depends greatly upon the teacher's ability to select and arrange these materials in such a way as to bring them within the growing capacity of the child and yet to stimulate perpetual effort. All of the foregoing and much more may readily be covered in a simple way in the first three years of a child's school life. The enlargement of the scope of the study in the following years gradually differentiates into geography, botany, physiology, physics, chemistry, meteorology, astronomy, zoology, and geology.

The grade teacher's preparation therefore includes a fair knowledge of these subjects and familiarity with the natural history of the locality. The following books will prove helpful in getting acquainted with the possibilities of nature study. They cost but a small sum and will serve as helpful guides in almost any locality. The list is made sufficiently large to show the range of books within the teacher's reach: *In Nesting Time*, Olive Thorne Miller; *Animal Life*, Bass; *Four Feet, Two Feet, No Feet*, Laura Richards; *Short Stories of Our Shy Neighbors*, Mrs. A. K. Kelly; *Country Cousins*, Ingersoll; *My Saturday Bird Class*, M. Miller; *Neighbors with Claws and Hoofs*, Johonnot; *Neighbors with Wings and Fins*, Johonnot; *My Land and Water Friends*, Bamford; *Little Folks in Feathers and Fur*, Olive Thorne Miller; *Up and Down the Brooks*, Bamford; *Bird Ways*, Miller; *Population of*

an Old Pear Tree, Van Bruyssel; *Plant Life*, Bass; *The Fairy Land of Flowers*, Pratt; *Little Flower Folks*, Pratt; *Stories of the Trees*, Dyson; *From Seed to Leaf*, Newell; *Flower and Fruit*, Newell; *Plants and Their Children*, Mrs. W. S. Dana; *Geological Story*, J. D. Dana; *The Rollo Books*, Abbott; *Real Fairy Folks*, Meyer; *Simple Experiments in Science Teaching*, Bower; *The Fairy Land of Science*, Buckley; *Stories Mother Nature Told Her Children*, Andrews; *Kindergarten Stories and Morning Talks*, Wiltse; *Seven Little Sisters*, Andrews; *Madam How and Lady Why*, Kingsley; *Nature Myths and Stories for Childhood*, Cooke; *Seaside and Wayside*, Wright; *Cat Tails and Other Tales*, Hawliston; *Home Studies in Nature*, Treat; *Brooks and Brook Basins*, Frye; *Nature Study for Common Schools*, Jackman; *Nature' Stories for Youngest Readers*, Anna C. Davis; *Nature Miracles*, Gray.

The limits of this article will not permit more than the briefest suggestions on methods in nature study, and the teacher is referred to the general texts already named as well as to the various able monographs published on the subject.

The first essential is to secure the co-operation of the home. If the teacher and the parents are working together, interest and progress will seldom flag.

The second essential is the wise selection of the material as already mentioned.

The third essential is the perfect familiarity of the teacher with his material.

The fourth essential is the sympathetic adjustment of the teacher to the child's consciousness. The fifth essential is the use of properly correlated literature and nature stories. Invaluable material will be found in several of the books already mentioned and also in the following: *Classic Stories for the Little Ones*, Mrs. McMurry; *Open Sesame* (prose and poetry for school-days), Ginn & Co., Pubs.; *Fairy and Folk Stories*, Scudder; *Andersen's Fairy Tales*, Stickney; *Tales of Troy*, De Garmo; *Stories from Plato*, Burt; *Heart of Oak Books*, D. C. Heath & Co., Pubs.; *In the Story Land*, Coolidge; *Child's Christ-Tales*, Hofer; *Hawthorne's Wonder-Book*, Houghton, Mifflin & Co., Pubs.; *Six Stories from the Arabian Nights*, Elliot; *Child Stories from the Masters*, Menefee; *Kingsley's Water Babies*, Stickney; *The Story Hour*, Kate Wiggin and Sarah Smith; *Apple Blossoms*, Scott, Forsman & Co., Pubs. See also the poets of every clime.

These stories serve not simply to entertain the child, but to enlarge his vision, to give his imagination free exercise, to intensify his interests, to cultivate his memory, to increase his vocabulary, to develop his powers of expression, to create a sympathy with life and to prepare him to appreciate the higher forms of literature. By their proper use, the nature world soon begins to glow with meaning and everything about the child speaks to him in a language which he can understand.

Nature study, as stated, furnishes the opportunity for a natural introduction of the elements of the formal studies as well as of the sciences. This fact enables the teacher to begin language and number teaching in the concrete and to utilize drawing, writing, music, and reading in the same way. Thus has arisen the plan of organizing the course of study in the grades known as correlation. For an elaborate discussion of the principles of correlation, see the *Transactions of the National Educational Association* for 1895, 1897, and 1899. For concrete illustrations of methods of correlating, see part II, *of Apple Blossoms*, published by Scott, Forsman & Co., and *Object Lessons and How to Teach Them*, Ricks. See also De Garmo's *Herbart and the Herbartians*, McMurry's *Elements of General Method*, Rein's *Outlines of Pedagogics*, and Ladd's *Philosophy of Mind*.

PHYSICAL EDUCATION AND MANUAL TRAINING.—The nervous system serves a double purpose in the physical organism of the child. It is the medium through which the external world excites sensations in consciousness and stimulates the intellectual faculties to action. This may be called its ideational function, for it is the occasion and source of ideas. It also serves to direct the movements of the various muscles and organs of the body. This is called its motor function. The development and co-ordination of these two great functions in such complemental relationship that they are always in free reciprocal action is to be provided for in every rational system of education. Nature study furnishes the means for the development of the ideational or intellectual activities of the child and also calls his motor activities into continuous action. The motor impulses antedate the birth of the child and during his waking hours for the first six or eight years of his life he is seldom willingly at rest. By experimentation he gradually differentiates the movements of the body as a whole, gaining that control and direction of the different organs which enable him to do things with ease and dexterity. The imitative impulse helps him to work out these problems of physical control in his earlier years, though the assistance of the members of the family aids him greatly at every step. Systematic calisthenic exercises may be introduced before the child enters school, but they should occupy a few minutes on each school day's programme after that. They should include exercises in breathing, in movements of the body as a whole and of the upper and lower extremities; they should develop the vital organs, grace in form and movement, strength, and subserviency of the body to the demands of the will. During all of these years great care should be given to the sleep, the food, the clothing, the personal habits, and the outdoor exercises and plays of the child, for in them all are found the factors that insure him health and vigor in after-life. For a detailed

treatment of this subject, see almost any work on hygiene, sanitation, and gymnastics. See particularly, Mason's *Manual of Gymnastic Exercises for Boys and Girls*, Anderson's *Methods of Teaching Gymnastics*, Blaikie's *Sound Bodies for Our Boys and Girls*, Keen's *American Health Primers*, Hunt's *Handbook of Light Gymnastics*, Morrison's *Ventilation and Warming of School Buildings*, Oswald's *Physical Education*, Safford's *Health and Strength Papers for Girls*, American Book Co.'s *Health for Little Folks*, Clarke's *The Building of the Brain*.

MANUAL TRAINING includes the school arts of writing, stick laying, drawing, wood working, clay modeling, wood carving, sewing, weaving, painting, etc. The handling of simple tools at home, such as the knife, the pencil, the pen, the needle, the scissors, the hammer, etc., anticipates the use of similar tools in the schoolroom and helps the child in the development of motor control as well as of manual skill; in fact, there is hardly anything that he does at his games or his work which does not serve a similar purpose. The course of study in every well-organized school gives a prominent place to some of the other school arts as well as to writing. Their place in the education of the child is being recognized more generally in all advanced systems of education than ever before.

Not only do they develop motor control and skill in doing things, but each act reacts upon the apperceptive activities, building up clearer notions and more positive definitions. So generally is this fact realized that *thinking and doing* have become indissolubly united in scientific pedagogical conceptions. Everybody has noticed how quickly a little effort at making a picture or a model of a thing helps him to discover its essential elements and fix them in his mind. Give a child a pair of scissors and set him to work at cutting out paper pictures and then at cutting out forms in imitation of leaves, triangles, squares, etc., and note how it helps him to clarify his notions of their shapes, sizes, margins, etc. Add to the above a little exercise in drawing them, then let him lay them out with splints, or sew them on card board; then model them in clay or soap; then let him paint them in water colors. Test him on his ability to describe or to recognize them and his growth will be the best argument for their use. What is true in the simple forms is even more true in the complex, thus on the purely intellectual side supporting the systematic arrangement of a variety of manual training exercises through the grades and into the high school.

The value of manual training on the art side is clearly enough seen in its ability to hasten the attainment of physical control and skill in mechanical execution. The average man or woman on entering some industrial occupation finds himself greatly handicapped by the lack of manual dexterity which should have been attained in childhood and youth, the only time when it can be attained with economy. Expert lace makers, jewelers, engravers, seamstresses, pianists, and violinists, decorators and designers, penmen, and weavers are not the only people who need nimble fingers and well-trained hands for their daily work. They are demanded in every walk in life, and all systems of education should provide for their development.

The expense in the elementary grades for the materials for each of the arts named is not much more than for the materials for writing and is not burdensome in the higher grades. For an inexpensive little book on *Manual Training in the Grades*, Abbott, from which illustrations are taken, address F. B. Abbott, publisher, Emporia, Kan. For more elaborate treatises on the whole subject, see Tadd's *New Method in Education*, Love's *Industrial Education*, and Goetz's *Hand and Eye Training*.

The following brief teacher's working outline in manual training for the *first grade*, exclusive of penmanship and drawing proper, will furnish a fair view of the work now being done in the best schools. Some phases are necessarily omitted on account of lack of space.

The materials needed are splints for stick laying, wire half circles, coated paper squares of the six elementary colors, a few sheets of common cardboard, a few pounds of well-ground clay, a pair of scissors, a few skeins of colored worsted, a few skeins of carpet yarn for weaving mats, a few sheets of perforated figure papers, a few pounds of raffia for weaving baskets, a paper of large needles, and a half-dozen weaving needles.

The object of stick laying is to teach spacing, design, arrangement, and orderliness. The paper folding gives practice in the simplest hand movements and in the use of the inch measurement. Tracing on the back of the colored papers over the creases gives practice in precision and accuracy. Working out figures with worsted in perforated paper helps to fix forms and co-ordinates eye pictures and finger movements. Clay modeling develops the idea of form and cultivates the sense of touch. The weaving serves many of these purposes and in the succeeding grades makes an excellent introduction to industrial occupations.

The course is arranged for two fifteen-minute periods per week; one in clay modeling and one in stick laying or paper folding.

The work is planned for twenty-three weeks; the numbers refer to the number of week, and the letter to the lesson.

1. (*a*) After conversation on the sphere, model the sphere, using fingers only.
(*b*) Measure side of four-inch red square.
2. (*a*) Model a spherical object.
(*b*) Lay red sticks to form a border illustrating repetition.
3. (*a*) Model a spherical object.
(*b*) Measure side of four-inch orange square. Fold, making a diameter. Teach diameter.

Measure distance from end of diameter to corner. Fold, forming a diameter at right angles to the first diameter. Trace on the back of paper over the creases, making a cross.

4. (*a*) Model a cube.

(*b*) Lay orange-colored sticks to illustrate repetition of twos.

5. (*a*) Model a cubical object.

(*b*) Fold a four-inch yellow square so as to form sixteen one-inch squares. Measure the squares. Trace on back of paper over the creases.

6. (*a*) Model a cubical object.

(*b*) Lay yellow sticks illustrating the repetition of threes.

7. (*a*) Model an isometric cylinder.

(*b*) Fold a green square to form a diagonal. Fold to form a diagonal at right angles to the first. Make six folds parallel to one of the diagonals, making equal spaces. Trace on the back of paper over the creases.

8. (*a*) Model an isometric cylindrical object.

(*b*) Lay green sticks to illustrate alternation.

9. (*a*) Model an isometric cylindrical object.

(*b*) Fold blue square same as in lesson 7(*b*) and in addition fold six creases parallel to the other diagonal, thus forming small squares. Trace over some of the creases to make a design, which shall be symmetrical.

10. (*a*) Model a cylindrical object with rounded ends.

(*b*) Lay blue sticks to illustrate oblique alternation.

11. (*a*) Model an object like cylinder.

(*b*) Fold a violet square as in lesson 9(*b*) and trace pin wheel design on creases.

12. (*a*) Model an object like cylinder.

(*b*) Lay violet sticks in design as a modification of 10(*b*).

13. (*a*) Model a sphere and bisect it with a string.

(*b*) Fold red square as 9(*b*) and trace symmetrical design on creases.

14. (*a*) Model a hemispherical object.

(*b*) Lay red sticks to form a Greek border.

15. (*a*) Model a hemispherical object.

(*b*) Fold a diameter in an orange square. Make six folds parallel to the first diameter. Form the same number of folds at right angles to the first set, thus making sixty-four quarter-inch squares. Draw a symmetrical design by tracing over the creases.

16. (*a*) Model a square prism and bisect across corners, forming a triangular prism.

(*b*) Lay orange sticks to illustrate alternation.

17. (*a*) Model a square prismatic object.

(*b*) Fold a diagonal in a yellow square and also seven creases parallel to it. Fold a set at right angles to the first. Draw symmetrical design on creases.

18. (*a*) Model a triangular prismatic object.

(*b*) Form a flag with three yellow sticks.

19. (*a*) Model a cylinder and bisect it.

(*b*) Draw the diameters and diagonals on the back of a blue square. Connect the end of the diameters in such a way as to form a square. Cut on the lines with scissors, making sixteen right-angled triangles.

20. (*a*) Model a hemi-cylindrical object.

(*b*) Make two borders using eight triangles of lesson 19(*b*) and blue sticks. These may be mounted.

21. (*a*) Model a hemi-cylindrical object.

(*b*) Draw on back of blue square two sets of parallel lines at right angles to each other, forming sixteen one-inch squares. Cut with scissors.

22. (*a*) Model cylinder with rounded ends. Bisect it.

(*b*) Arrange seven squares of lesson 21(*b*) in borders.

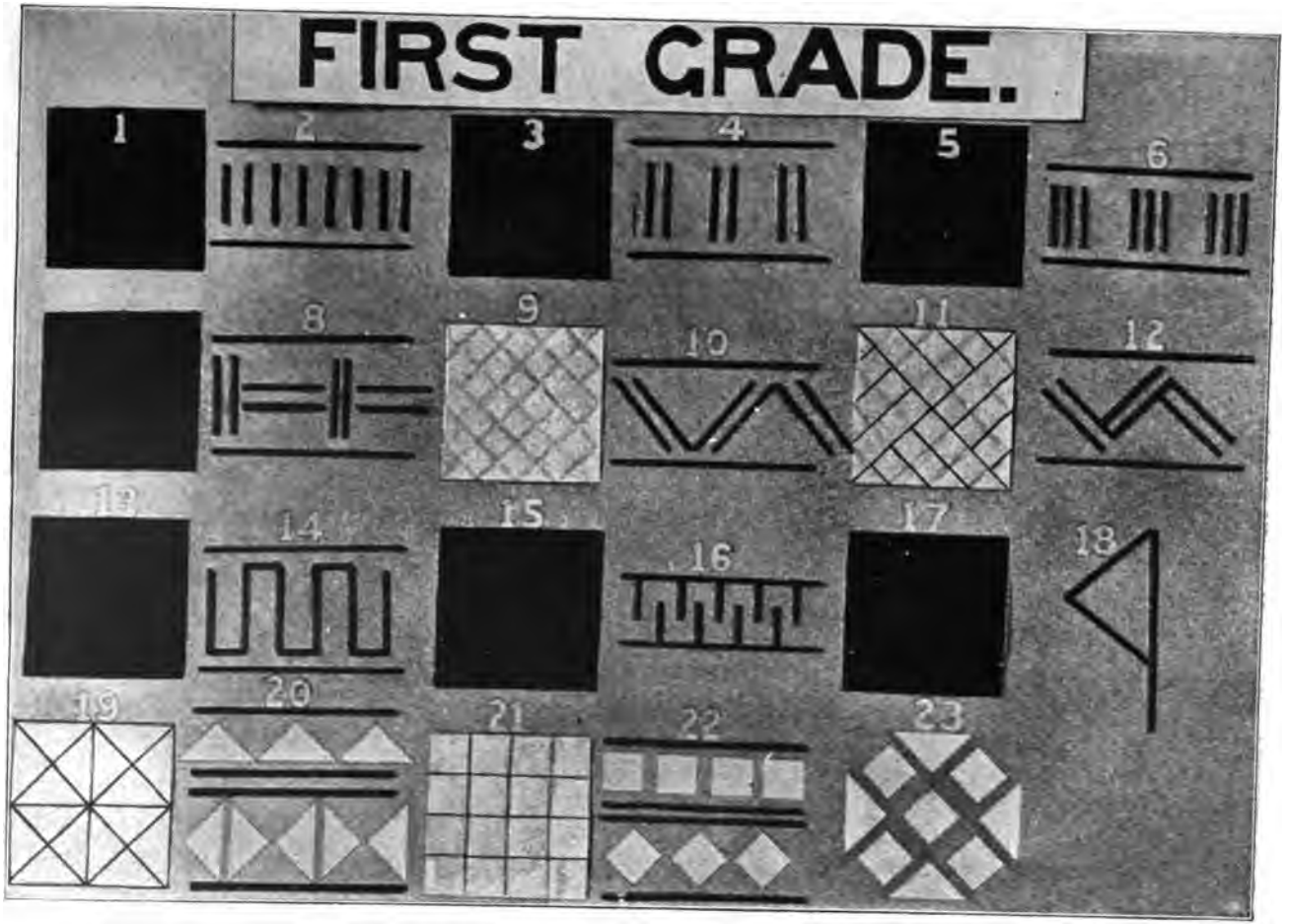
23. (*a*) Model a hemi-cylindrical object.

(*b*) Make a design of blue triangles — of lesson 19(*b*) — and blue squares — of lesson 21(*b*).

The knife and a few other simple tools are introduced as the work advances and habits of originality, of accuracy, precision, and speed are inculcated throughout the course. The views of specimens of work done in grades seven and eight show how the skill of the pupil develops through the years.

All of the work for the grades can be done on the ordinary school desks, though as a few heavier tools may be introduced in the seventh grade, benches will then be needed. In the high school, the work properly differentiates into certain specific lines each for the boys and the girls. Work benches, full sets of tools, lathes, scroll saws, etc., are needed for the heavier work for the former; sewing tables or kitchen furniture, depending upon the direction the instruction takes, are needed for the latter. Tables and tools in common can be used for clay modeling, bent iron work, wood carving, etc.

DRAWING is now universally taught in the best schools, and ought to be provided for in every grade. Its value in the development of motor control gives it great pedagogic importance, but its value as an aid in building up notions of form, relief, symmetry, movement, etc., is no less marked. Properly taught, its æsthetic value soon manifests itself even among little children. The practical value of drawing is seen in a great variety of industrial occupations, as well as in what are usually denominated the fine arts. Drawing serves to help to fix attention to many details in nature study, and adds surprising zest to children's work in getting the meaning of the printed page. The danger in teaching drawing is that the teacher may make it purely mechanical, lacking significance and life, meaning and movement. All scientific teaching involves both, and drawing is no exception. The initial movement in the first grade should be constructive, and the creative impulse of the child should be quickening and


FIRST GRADE.
1
2
3
4
5
6
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23

SEVENTH GRADE.
1a-2a
3a-4a
5a-6a
7a-8a
9a-11a
12a-14a
18a-22a
23a-26a
27a-33a

EIGHTH GRADE.
1a-3a
4a-6a
7a-9a
10a-15a
28a-30a

enlarging at every step. Every process of analysis should end in reconstruction, and should stimulate invention.

In selecting a system of drawing books, the foregoing facts should not be forgotten. Much harm is frequently done by the failure to observe the law of sequence in organizing the work for the drawing classes. This law means more than the average teacher sees in it. It involves the organization of the exercises in such a way that the simpler in order develop skill for undertaking the next higher and more complex. All exercises for the development of motor control should follow the same law. It is the fundamental economic principle underlying the development of the mental activities as well.

The student and teacher will find any of the following systems, as outlined in their texts, well adapted to public school demands: Thompson's, Prang's, Cross', and White's. See also Morton's *Chalk Illustrations*.

PENMANSHIP is usually taught simply for the purpose of enabling the children to write a fairly legible hand. Its place as a means of contributing to motor development is generally overlooked. It is safe to say that few other subjects are taught with such meager satisfactory results as penmanship.

In the first place, there is little system in the methods in use; in the second place, too much time is spent on the writing lesson proper, each day; in the third place, the children are permitted to fall into careless habits in their writing in general, thus overcoming the good effects of class work.

Nearly all the modern texts on penmanship give necessary suggestions concerning methods of teaching the subject, which, if intelligently followed, should give excellent results. They are based upon the law of sequence, with its wider meaning, as explained in the paragraph on drawing, but they frequently exact more time per day than should be allotted.

Good penmanship is dependent upon perfect motor control. That is a growth of years. It cannot be forced, but it can be directed and hastened. The other school arts help to its attainment, and their correlation with penmanship is essential to rapid progress. If half the time now given to penmanship were given to them, there would be a gain to it, and they would be perfecting in like manner. The handwriting which the children would attain would prove permanent and would not deteriorate, as it usually does under the hot-house methods by which many writing teachers gain reputations.

Writing is but the record of muscular action. If the latter is accurate and graceful, so will the former be, hence the importance of the right kind of drill in the movement exercises. Such exercises should not only be on letters and parts of letters, but on words, as well. They should accompany the acquaintance with all new words, helping not only to fix their visualization, but also to fix their muscular pictures. This muscular spelling is vastly more important than oral spelling, for the latter is seldom used in the grades outside the regular spelling class, and almost never, afterward.

Exercises in writing words, logically selected, from the movement point of view, serve at once as exercises in spelling and penmanship. No other principle should dictate the classification of words in spelling lessons for the lower grades. Sufficient drill should be given on each new word to fix the muscular picture and the muscular movement accurately and permanently. When that is done, poor spelling will disappear and poor writing also.

Arbitrary slant and strictly vertical systems of penmanship cannot logically sustain themselves. Natural slant commends itself to the reason, and practically controls everywhere. Among the best up-to-date texts and courses are the Roudebush, the Zaner, the Jackson, the Natural Slant, and the Natural and Individual system by the Penmen Publishing Co., Port Deposit, Md.

LANGUAGE TEACHING.— Language has always occupied a high place in educational systems. It needs no argument to support its claims to recognition in a course of instruction for the youth in any time or clime. It is the first fine art which the child undertakes to learn; it is indeed the only fine art which all children cultivate to an appreciable extent. Being the vehicle of expression for every normal child and the only means for the rapid, diverse, and continuous exchange of ideas so necessary in every walk and stage of life, its value appeals alike to the artisan and the artist, the poet and the philosopher, the peasant and the man of affairs.

Beginning with the simple ejaculations accompanying the first glimmerings of consciousness, the child quickly and instinctively adopts the words he hears to designate the objects about him and to express the subjective states produced by his ever-enlarging experiences. With each new experience comes the demand for a new word. If the proper word be furnished at the proper time, it helps the child to differentiate the new object or the new experience from those preceding and to fix it more clearly and more permanently in his mind. Words greatly assist the child in the cleavage or differentiation of elements in his world of experiences, as well as in the construction of his notions and ideals from them. His mental growth is as much dependent upon the increase and the character of his vocabulary as upon the extension and variety of his experiences. Keenness and delicacy of perception are hardly attainable without the aid of words of equal delicacy of shades of meaning. This principle is even more evident of the higher activities and of the sentiments.

It has been well said that no nation lives morally higher than its language and that its

ideals and aspirations are no larger than its literature. It is equally as true of the individual. Mind culture and language culture are indissolubly associated throughout the whole home and school life of the child. The former is the object of all education, the latter is its necessary accompaniment. Clearly then, all other things being equal, the better the language the child hears and appropriates the more rapid and the more systematic will be his mental development. The superficial mind fails to observe the fact that the teacher usually must not only correct the language of a pupil, but his modes of thinking as well. When the latter is done, the former generally takes care of itself. This fundamental principle should dictate all language teaching whether in the home or in the schoolroom, whether in the primary grade or in the high school.

The most important thing in methodology is to help the child to the attainment of correct habits of perceiving and thinking; the next, to help him to the correct and forceful use of language in expressing his thoughts about the things he sees and hears and smells and tastes and feels.

A prerequisite to successful language teaching is clear thinking and accurate language on the part of the parent and teacher. The unconscious, ever-active imitative instinct of the child is generally more powerful than oft-repeated precept. "Nothing sinks so quietly and deeply into men's minds as example." This is probably more true of language than of any other subject of instruction. The art side of language is its use; the technical or scientific side is the knowledge of its structure and functions. In comparison with the other arts in general, it is unique in the fact that the study of the scientific side must await long years of use. While this is true of the mother tongue, it is not necessarily true of a foreign tongue, as it may be learned either by beginning with the grammar or by the conversational and constructive method. Though, so far as the child is concerned, he must enter upon the large use of language before knowing much of its science, that use should be scientifically and sympathetically directed by those intrusted with his education. The art of directing language culture presupposes a scientific knowledge of its genesis, its structure, and its function. It presupposes a knowledge of the nature and genesis of the mental activities as well.

As the child learns to read, his horizon gradually extends and words multiply almost as rapidly as ideas. It is important that the new words met in his reading should be clearly understood and used frequently enough in his conversation to insure them a permanent place in his vocabulary. If the process be properly conducted by the teacher, the transition to the printed page presents little difficulty to the child. As has been said, much depends upon the language which the child hears, but the necessity for pure diction and graceful style in the books he reads is no less vital. It cannot be too frequently repeated that while the child is appropriating words, he is also unconsciously appropriating forms of expression and of thought that soon become dominant and permanent elements in his intellectual life.

Language culture does not begin with the study of technical grammar, as too many people suppose. It begins with the child's first efforts to talk and is affected by everything he learns in the world about him and from the books he reads. It would be a serious error to interpret the foregoing as meaning that the instruction of the child should be so formal and stilted as to ignore his stage of development and to repress all originality and spontaneity. The child must not only be permitted to think and act as a child, but to speak as a child as well. Common sense is the most potent element in all successful teaching. The problem is to train the child to better child thinking and to better child language at every step of his progress and to do it in such a way as not to rob him of his great heritage,—*the privilege of being a child and of growing in a natural way to mankood.* The enrichment of the child's language at every stage of his growth will be accelerated more by the books of the high character named than by any text-books on grammar and rhetoric, however skillfully written. By the potent influence of their silent reading, they develop vigor and strength, precision and elegance, characteristics in every mind as essential as the knowledge of the subject-matter of which the books treat. The ideal books for children as well as for adults, however, are not of indifferent themes, but rather of those which touch the individual life on its universal side, which quicken and hold interest, which extend vision and develop life.

The choice of stories and of books for children should also be controlled by their environment and by their stage of development. They should correlate closely with the home life of the children and with the course for nature study in the lower grades. They should serve to stimulate observation and increase interest in everything with which the children come in contact. They should present pictures of other times and other lands somewhat similar to those of the little world in which the children live. Stories of primitive people, of Bible characters, of plants and animals, fairy tales, and simple fables always attract small children. At first they should be told or read to them and the children encouraged to reproduce them. As they are able to read for themselves, the repeated reproduction of the story in their own language should never be overlooked.

The following will illustrate the classes of stories which may be profitably used in the primary grades: Stevenson's *The Hay Loft;*

Kingsley's *The Lost Doll;* Andrews' *Seven Little Sisters* and *Ten Little Boys on the Road from Long Ago;* Longfellow's *The Builders;* Andersen's *The Fir Tree* and *Five Out of One Shell;* Field's *Rock-a-by-Lady* and *Little Boy Blue;* Wordsworth's *The Kitten and the Falling Leaves;* McDonald's *Little White Lily;* Sarah Wiltse's *The Diamond Dipper;* Lucy Larcom's *The Shower and the Flowers;* Susan Coolidge's *The Little Christmas Tree;* Amy Fisk's *Good Morning, How the Leaves Came Down, How The Chipmunk got Stripes on His Back, The Little Golden Rod, Seedlings on The Wing,* etc. The courses of supplementary reading specified for the grades in almost every first-class city school will be found useful in making selections for language work. Recognized classics only should be given to the children, because they alone lead them into the realms of universal interests. If wisely chosen, the series will beget a refined literary taste and an ever-increasing love for better literature. Statistics show that the child thus trained enters society with the least friction, and with clearer conceptions and higher moral courage takes up his part in the drama of life.

Language culture comes by practice in the intelligent use of words in conversation and in writing. When a child has something to say he ought to be encouraged, not simply permitted, to say it. He ought also to be given sufficient time to say it without that embarrassment which is the pernicious breeder of ill-chosen words, of incorrect pronunciation, of faulty construction, of unfinished sentences, and of what is far worse, if possible, of confused and indefinite thinking. He should not only be taught to use the truest word, but to use the truest sentence also, and to be unwilling to use any other. Tendencies to caprice, affectation, and carelessness should be wisely suppressed as they appear. While reproducing stories told or read to him, the child should use his own language, but he should be encouraged to use as many of the new words he has heard or seen as he can use intelligently. Discreetly, patiently, lovingly, parents and teachers should direct his early efforts in picture and word building. As the movement is continuously constructive, it offers unlimited opportunities to the growing child. With the extension of his knowledge into the larger fields of science and of the arts, as well as into the spheres of biography, history, literature, and national life in general, language continues to be the child's greatest passion, and loftier themes its perennial inspiration.

In his helpful book on *Teaching the Language-Arts,* B. A. Hinsdale enumerates the four agents that promote education in the vernacular language:—

1. Association, or social relations with our fellows, including listening to cultivated speech of a formal character, as sermons, orations, and the like.

2. The reading of good literature, both in and out of school.

3. Formal instruction in the language-arts, speech, reading, and composition.

4. The scientific study of language, and particularly of one's vernacular, or grammar.

"The first of these agents works in the life of the child from its birth, ceaselessly and powerfully. In no field of human activity or cultivation does imitation play a greater part than here. The second and third agents do not appear in the life of a majority of children until they go to school; and even in the minority, who have made some progress in those arts before that time, they work but feebly. Here, too, imitation asserts itself strongly. The fourth agent never becomes a practical factor in the education of a majority of children, because they do not study grammar; while in the cases of those who do study it, it is much less effective than the other three."

The construction of the first written sentence, be it ever so simple, is a great event in the life of the child. In it he enters upon the exercise of a new range of activities, a new form of expression. He now writes the word which he has only known how to speak, he sees the word which he has formerly heard. Other sense and motor centers become language centers also, and become connected with those already established. It is important that in taking up this new phase of the language-art, the child's mode of thinking should not be changed. His thoughts should run as easily, as naturally, as unaffectedly, in writing as in talking. It should be the same child that writes and talks. The deliberation incident to writing ought not to destroy spontaneity and separate the child from his natural self. It ought, however, to develop discrimination in the use of words and skill in the construction of sentences. Writing makes the exact man, and the influence of writing sentences and original descriptions and stories upon the oral language of the child is incalculable. If properly conducted, all exercises in both, mutually strengthen and perfect each other. The frequent and rapid going back and forth from one form of expression to the other, will help to preserve naturalness and develop facility in the use of both. The reason so many people find writing such a burden is that they were given little intelligent exercise in it in their childhood. This would not be cause for so much lamenting were it not that their oral language is usually correspondingly defective.

The mechanics of written language are no less important than those of oral language, which is treated elsewhere. Writing as a purely mechanical art is more properly denominated penmanship, and yet all expert teachers of that subject recognize the mental as well as the physical activities involved in the process. They are not unmindful of the fact that however desirable rapidity of movement, grace of form, or clearness of outline

may be in themselves, the end of it all is to give the child a ready and an effective means of expressing thought. The earliest exercises in penmanship should therefore be organized with reference to that end. When a pupil is ready to lay aside his regular practice in penmanship, the process should have become so fully a part of him that as he writes he need give no more attention to the mechanics of it than to the mechanics of his voice as he speaks. Writing lessons then should include an increasing amount of original composition with the advancing grades.

With the introduction of written language comes the introduction of exercises in capitalization, punctuation, indentation, and paragraphing. The capitalization of proper names may be introduced with the names of the days of the week, holidays, names of persons, etc., and as the child begins to understand what a proper name is; indeed its introduction will help to emphasize the last named idea and to stimulate the recognition of proper nouns as he meets them. As he is able to get a similar understanding of the other rules for capitalization they should be given with appropriate practice. In a similar way punctuation should be taught. It is an easy thing to teach the simpler uses of punctuation marks, but it is a great mistake to force their use upon the pupil before he is sufficiently familiar with the parts of a sentence, or of the discourse which they set off, to use them with reasonable intelligence. The ignorant or mechanical use of punctuation is worse than no use at all. It begets bad habits and lifelong confusion in actual practice. The world of letters got along for many centuries without them and the child need be in no undue haste about learning them. Successful punctuation in general composition is based upon a knowledge of sentential structure that comes only with mature scholarship.

Paragraphing in writing descriptions and narratives may be taught, at least in an approximate way, very early in the grades. It soon begins to serve as a means of differentiating the principal elements of a discourse and of magnifying the importance of unity in its construction as a whole,—two fundamental processes too little followed in composition.

Phonic analysis as an oral exercise is excellent drill for the primary and intermediate grades, though care should be taken not to use words with silent letters until the children can spell them both phonetically and alphabetically without confusion arising from their differences. The difficulties in pronunciation practically disappear in phonic analysis, for it is simply slow pronunciation. Spelling should never be overlooked in any written work, whether in dictation copying, or original composition. Generally speaking, children should see each new word in script before attempting to write it. It is that which they are to reproduce and not the printed nor the spoken word. The eye picture and the muscular picture in the writing process are to be so merged into each other that in consciousness they become practically one. Each new word should be written a sufficient number of times and in such varied relations as to fix so clearly and accurately the muscular movement involved that its future writing will be automatically done. Experience has shown that such a method of teaching spelling insures accuracy in spelling throughout the grades that no other method has produced. In practical life nobody spells many words orally. Why spend so much time in oral spelling as is frequently done in the public schools?

In language teaching, even in the lower grades, each child should be taught the meaning of the more common words both by definition and synonyms and by their use in sentences. At the same time the teacher may tactfully build up in the minds of the children notions of the different classes of words, the parts of speech, as they are called. They seem naturally to develop in the following order,—nouns, verbs, adjectives, adverbs, pronouns, conjunctions, prepositions, exclamations. By the close of the first year, the pupils should also be familiar with the time forms of the more common verbs, the number forms of nouns used, and the degrees of comparison of the more common adjectives and adverbs. The same exercises, a little more advanced, should be continued through the second year.

The third year will be well employed in teaching additional verb and noun forms, classes of adjectives, etc. The fourth year should give the pupil familiarity with a large range of the forms mentioned, with the more common homonyms and synonyms, with the use of capitals, periods, interrogation and exclamation points, the apostrophe in contractions and in the possessive case, and the comma in a series and in addressing letters.

Though in preceding grades the different kinds of sentences as well as the simple division of each should have been frequently noted and illustrated, they should receive more critical attention in the fifth grade. This year's language work should include the general classification of nouns, verbs, and adjectives, together with a free analysis of easy sentences and abundant drill on adjective and adverbial forms. Each year's work should re-enforce that of the preceding year by rapid illustrative reviews. As pupils enter the sixth grade, they should have exercises in great variety calling into use the different tense and voice forms of verbs, and the different classes of conjunctions and pronouns. They should also have ample drill in substituting alternately phrases and single words and in expressing ideas in a variety of ways, supporting preferences.

Children in the fifth and sixth grades find the origin and history of words a fascinating

subject. Exercises in making new words by means of prefixes and suffixes should be frequently given. Each story read, particularly if it be a story of classic lands, affords opportunity to illustrate the source and growth of words. For example, the stories of Hector and Tantalus give us hector, hectoring, tantalize, tantalizing, etc.

The foregoing shows briefly the method of developing the technical side of language and of preparing the child to enter upon the more formal study of grammar. For a more detailed outline for these and higher grades, the teacher and student are referred to the more elaborate state and city courses of study for the common schools and to the standard works on grammar. The formal study of rhetoric and literature belongs properly to the high school.

The bibliography of language teaching is now so rich and helpful that there is little excuse for faulty work in this subject. The following are among the best books: *Teaching the Language-Arts*, B. A. Hinsdale; *Talks on Writing English*, Arlo Bates; *The Forms of Discourse*, Cairns; *The Science of Discourse*, Tompkins; *Part Third of the Report of the Committee of Fifteen*, W. T. Harris; *Essentials of English Grammar for the Use of Schools*, Whitney; *Life and Growth of Language*, Whitney; *The Story of the Alphabet*, Clodd; *Everyday English*, White; *On the Study of Words*, Trench; *Synonyms*, Crabb.

A. R. Taylor.

Methods in Reading.—The teaching of reading in the grades should have in view four objects, — rapid recognition of sentences as symbols of thought, concentration of attention upon the thought read; the development of a discriminating judgment, and the power of *expression*. The last named includes extemporaneous speech and interpretative reading.

The reading lesson should be the introduction to the world of letters. It should cultivate literary taste. It should mould thought and character.

Good literature, like good music, must be *heard* often to be thoroughly appreciated. The ear as well as the mind should be trained. The children of a few parents have this opportunity in their homes; but the children of the many have only what the public schools can offer them. It is very essential, then, that every teacher of the grades should have a cultivated voice and literary tastes. A beautiful reader can lead children to love the classics.

Reading to the children should be a part of the weekly programme throughout the first eight grades of the public schools. Once a week, the teachers should read aloud to the children, and conversation upon the subject-matter read, or a reproduction of it, should follow.

The classics read to and by each grade should be carefully selected and graded. This choice should take into account the awakening of a love of nature, the cultivation of imagination, the teaching of truth and right, patriotism, and the formation of true literary taste. This reading should help to make character, awaken thought, and teach the simple duties of daily life. Haphazard reading to children, or by children, does not accomplish the same result. There should be a definite plan in the presentation of all of this work. The children should be introduced gradually to fiction, poetry, natural history, biography, history, and travel.

The class or department library meets a need at this point. When each class-room has its own carefully selected and graded library, it places within the reach of children a great educational influence. It gives children the opportunity to handle books and to know books. The teacher here has an opportunity to guide and interest children in reading literature.

To cultivate concentration of mind, and to develop command of language and natural conversational delivery, there should be frequent oral reproductions by the children of paragraphs read by them. This tests their grasp of the thought.

The study of reading should lead to and overlap the study of language. The reader, in following and grasping the consecutive thoughts of an author, follows the mental processes of the author, and, step by step, thinks his thoughts after him. Continued careful and thoughtful reading trains the mind to careful and logical thinking. Reading that is *thinking* awakens the creative impulse, and the effort to express the soul within through interpretative reading or authorship. Healthy growth of mind must find expression in some way. What more stimulating means to the boy or girl than the interpretation of the noblest thoughts of the great masters of literature!

We must bear in mind that the study of reading in the grades is a literary study, and that every child should not only be led to *understand* the thought of literature, but to interpret it. Reading is not simply the saying of words. It is putting into the words read the reader's thought as *he* thinks the words. He colors with his own thought and feeling what he reads. He interprets the soul of literature. Beautiful reading is a rare accomplishment because few have learned the secret of interpretation. The secret is oft repeated study to understand every possible shade of thought, coupled with daily oral practice to express every shade of thought.

Sometimes the mechanics of reading are dwelt upon at the expense of the thought; sometimes the thought interpretation is magnified at the expense of the mechanical part of reading. Both are essential. But in all the teaching of interpretative reading, great care should be exercised to lead the readers to *think the thought* as they read aloud, and not weaken the expression of the thought by

thinking of the technical or mechanical form of the reading.

Many methods of teaching primary reading have come and gone. Still the fact remains that in some places beautiful reading always has been, and always will be, found. More depends upon the teacher than upon the method. Thought should precede expression. Let the method here suggested be called a *thought* method, and its chief object *expression*.

First Year.— It is best that only one small group of children should gather at a time about the teacher for recitation, while the other groups are engaged in busy work at their seats.

The first five or more "reading" lessons should be purely *conversation* between teacher and pupils. The object of this is to prepare the way for conversational tones in reading and speaking.

The next step should be to draw forth from one of the children a complete sentence, and immediately write it in *script* on the blackboard, at the same time telling him that it is his sentence. The child should be asked to read his sentence. The teacher should see to it that the little reader never loses the natural inflections and modulations of the voice.

This same sentence should be developed with, and read by, each child as before. Then the teacher should erase all but one sentence. This she should cover, and then ask the children to think how it looked. This is an important step, for it is the first lesson in how to study,— concentrated attention.

The sentence work should be continued about fifteen weeks, when the study of words should begin. By the eighteenth week the study of words should be followed by the study of the alphabet, and this in turn by a few of the elementary sounds.

At the close of the twentieth week, the transition from script to print should be made. It would aid very materially in the success of teaching reading at this stage, if the teacher could have several sets of first readers in which the script sentences are accompanied by corresponding printed sentences just below. The wise teacher will have developed in script the sentences that the children will find later in the first half of the first readers they will use for sight reading.

New words of each new lesson should be written on the blackboard, and pronounced by the teacher. After the children have learned the diacritical marking and elementary sounds, they should determine the pronunciation from the word as it is marked diacritically by the teacher.

Children should be taught to *think* sentences as they read them, and the teacher should correct unnaturalness of expression or unpleasantness of voice.

During the last twenty weeks of the first year, the children should read through at sight all of the lessons of the first half of six or eight first readers. It is well to rotate the sets of books, reading the first lesson in the first set, the first lesson in the second set, the first lesson in the third set, and so on. In this way the reading material is more gradually graded.

As soon as children are able to read the simpler classics, these should be used for supplementary reading.

Some power of interpretation is developed by *sight* reading; but real opportunity for interpretation drill comes in the recitation of memory gems. By skillful questioning, description, and illustrative reading, the teacher should lead the children to understand and feel what they recite.

The following list of memory gems is here offered as a suggestion.

Memory gems for first and second grades:—
For the spring,
The Dandelion, by Proctor.
The Cuckoo, by Wordsworth.
For summer,
Seven Times One, by Jean Ingelow.
The Brown Thrush, by Lucy Larcom.
For fall,
Down to Sleep, by H. H. Jackson.
Little Boy Blue, by Eugene Field.
For winter,
Story of The Advent, Luke ii., 8 to 16.
The Snowflake, by H. W. Longfellow.

Second Year.— In the second year reading work, the study of the elementary sounds should be continued, and the children should be able to give, and to recognize, and to mark diacritically, all of these sounds at the close of the second year.

There should still be development of new words about to be read, sight reading, rapid thought analysis during sight reading, and a continuation of conversational reading. Classics should be read to the children and be reproduced by them. Memory gems should be studied and recited for expression of thought and feeling in voice and face.

While the children are reading through, at sight, the second half of the first readers, and the first half of the second readers, and a few second-year classics, they are gaining mechanical skill in reading words as thought symbols, and groups of words as thoughts. Children should be taught to utter words in groups, or to phrase as soon as long sentences are used.

Third, Fourth, and Fifth Years. — A similar plan should be followed for the reading lessons of these grades. In addition, attention should now be given to prepared lessons for interpretative reading. Each lesson for interpretation should be assigned, new words developed, allusions to history or literature explained, and attention called to points children should ascertain for themselves. The first recitation of the prepared lesson, if the selection is difficult, should be confined to the study of the text. The chil-

dren should be made enthusiastic in their effort to bring out the thought, and make it attractive to those who listen. During these years, the children should practice reading aloud at least a half hour daily. When children do not express the thought, they should again be helped to see it by explanation, or illustration, or description, or question. The teacher's voice, its sympathetic shading, and her interested manner, may be made an incentive to young readers. Judicious words of approval should be used to encourage each effort, however stumbling it may be, when the reader is beginning.

The dramatic element is especially attractive to children, and helps to hold their interest and to overcome self-consciousness. It adds to the zest of the reading lesson in those grades to introduce an occasional dialogue for supplementary reading. An arrangement of dialogues from the works of such writers as Kate Douglas Wiggin, Frances Hodgson Burnett, Sophie May, Nathaniel Hawthorne, and others, published by Messrs. Hinds and Noble, under the title of *New Dialogues and Plays*, would be exceedingly entertaining and profitable for these and the higher grades.

The memory gems should be wisely chosen; they should be selected with reference to beauty of thought and diction, and also for the lessons of patriotism, truth, gentleness, etc., that they will teach.

As no interpretation of literature can be beautiful without a cultivated voice, it follows that vocal exercises should now accompany the reading lessons. These should be given daily, and should lead to clear, musical tones, to distinct articulation, and to the expression of thought and feeling in the voice.

Sixth, Seventh, and Eighth Years.— In addition to sight reading, classics, memory gems, etc., of the first five grades, there should now be frequent drill in breathing exercises, vocal exercises, pronunciation, enunciation of difficult phrases, emphasis, spacing of words, and movement. This work should be carefully planned for each of the three grades.

There should be at least three prepared lessons per week in interpretative reading. This should include text study,—a study of the meaning and force of words, and at least an hour's oral practice daily. If the selections in the text-book used have not sufficient vitality and interest, the teacher should dictate something to the pupils that has.

During these three years the children should study, for the English and for the interpretation of the thought, several of the American classics. The study of the thought alone is not sufficient, for it is not until pupils repeatedly endeavor to interpret passages of literature that they see and feel the full beauty of thought. Getting at the soul of literature, requires close and careful study of the thought on the part of the pupil, and sympathetic and judicious leadership on the part of the teacher.

During the eighth year in school more attention should be given to the speaking voice. Children should be taught the importance of correct breathing and its relation to the voice and to health. They should be taught how to place the tone well forward so that the voice will become resonant and musical, how to support the tone so that it shall have a firm quality, and so on. A few simple exercises should be given daily, leading gradually to the resonant, firm, and well-modulated voice of the cultivated man or woman. The importance of the voice training in connection with interpretative reading can hardly be overestimated. It is a spiritual force in education, and may be made so by the true teacher.

It may sometimes be of great advantage to study one great classic throughout a year. Take "Julius Cæsar," for example, and make that the textbook for sight reading, paraphrasing, for interpretative reading, for memory gems, and for vocal exercises. The memorizing of a great literary work, the close companionship with its characters and their thoughts for many months lead to a deeper insight into the soul of literature. This is *knowing literature*, not knowing about literature.

With each effort to make vocal his own conception of the lines, the student not only gains in the power of interpretation but he gains in the power of self-expression. C. M.

Methods in Geography.— Geography is the study of the earth's surface as the home of man. It differs from physiography in this: that while physiography deals with the question, how the earth came to be what it is, geography devotes itself to the effects of surface features upon mankind. The chief characteristic of the study is the relativity of man to his home, and not, as often assumed, a mere description of the earth's surface. Neither is the study of man alone any nearer approach to geography, but if any thing, a wider departure. Not the home alone, nor man himself, but man in his home, — that is the function of geography proper. To Karl Ritter, the first great teacher of the subject, is due the credit of the present view of the true field of geography. The best-adapted definition of Ritter's somewhat involved one, is possibly that of E. C. K. Gonner, of University college, Liverpool: *Geography may be described as the meaning to man of the earth and its features as they are.*

Such being the scope of the subject, it is possible for its study to begin in the first grade. The outline of a course of study in geography, given by F. W. Parker in his treatise on, *How to Study Geography*, is a superior one for all the grades, but that part of it which deals with the work of the first grade deserves distinctive mention. It

aims to help the child to find himself, to realize his environment and the relations, so far as he may be capable of observing them, that exist between himself and his home. So taught, it must follow that the child will recognize the meaning which relates the Eskimo to the tundra, the Tibetan to the plateau, the Kirghiz to the steppe, the Negrito to the forest, and the Troglodyte to his cave. Studied in the way indicated, strange people will not necessarily seem "freaks," nor other parts of the earth "out of his world." His larger knowledge must increase his humanity, and enhance his appreciation of the earth.

John Burroughs somewhere states that the end of education is to know the earth as a whole. It is no easy task at best. Columbus cleverly set the egg on end. The teacher simply cuts the ball in twain, and what seemed a physical impossibility, both sides of a ball are shown at once in the hemispheres. It is a hard task to grasp the relations existing between the surface units of this earth, 200,000,000 square miles of land and water, and the peoples of the earth, 1,500,000,000 in all. But it is an end worth all the effort that the problems imply. The culture value of a knowledge of the meaning of the earth's features to man is enough in itself to justify the claims made for geography by the teachers of the subject, overshadowing even the so-called use value of its facts.

The sense of sight is involved in geography more than any other one of the senses. The first work done should be based upon observation almost exclusively. When the things present to sight have been pictured, then the imagination must be called into exercise to develop the power of visualization, so that absent objects, whether seen before, or only described, may be readily visualized. To this end, objects, models, sand pans, pictures, and descriptions should be used in abundance. The stereopticon can frequently be used to advantage. Closely following in the advancing grades, must come the reading of maps, through which the skillful teacher may bring out much correlative and associative material. The sand table, which has been in use through the preceding grades may still be used to advantage, although the teacher should ever guard against the evils of exaggeration. Chalk modeling is perhaps the best means for graphic work in treating small areas.

As aids to geography teaching, a magnet, a compass, a dipping needle, a dial, a rain-gauge, a weather vane, a thermometer, a barometer, stencils, colored crayon, and small papier-mache globes will be found useful from the first. For advanced work there are many more complex pieces of apparatus suitable for demonstrating the laws of the physical universe, as well as of the forces producing chemical changes. If there is one thing needing emphasis in geography teaching, it is more laboratory work, more of the fields, more of the world about us and less of books. Geography logically begins with nature study, and develops through an extension of community environment to continental and world environment. It includes such a variety of surface, meteorological, climatic, biological, industrial, commercial, social, and political problems that local material need never be wanting; neither need concrete illustrations in great variety be lacking as the vision of the pupil is extending beyond his own neighborhood.

The making of models representing groups of people in typical settings of the regions which they inhabit will always prove interesting and instructive. A lesson in modeling groups to represent *The Seven Little Sisters* will not fail to satisfy the teacher of the advantage of such work.

The sources of information on this subject other than the regular texts are authenticated cuttings from newspapers, articles in magazines, bits of personal experiences and books of travel, of which there are now hundreds written in a most delightful manner. Such books as Nansen's *Farthest North*, Abruzzi's *The Ascent of Mt. St. Elias*, Hedin's *The Roof of the World*, and Borchgrevink's *Story of the Farthest South*, are of especial worth, bringing to the class reliable matter rendered doubly interesting by the intensely personal flavor of the recital. It is to be doubted whether there is a better set of books in any single series for geographical work than Reclus' *The Earth and Its Inhabitants*. The voluminous publications by our state and national government are also of great value.

For the teacher *The Statesman's Year Book*, Redway's *The New Basis of Geography*, *The International Geography*, edited by H. R. Mill, and Adams' *Commercial Geography*, are almost indispensable. It should go without saying, of course, that every class room for the scientific teaching of geography should be supplied with a globe, up-to-date maps, atlases, gazetteers, and current geographical magazines. D. A. E.

METHODS IN HISTORY.—History is that branch of knowledge which treats of the life of peoples. That life expresses itself in activities centered about the home and its environments, and we say we are confronted by social problems. All of this is one phase of history. That life expresses itself in the evolution of school systems, and we say we are dealing with educational problems. It is but another phase of history. Again, that life expresses itself in the development of the natural resources of the country, in the intercourse of the nations, and in the adjustment of man's relations to his brother, in the determination of man's relations to his Maker, and we say we are considering human activities as manifested along an economic, political, or religious line. Each in turn is but another phase of history. True history takes account of thoughts and feelings and motives, of influences and tendencies and

environment. An event is but a landmark. It is but the register or index of this life-movement. True history not only deals with the past, but with the living present. Furthermore, it reaches out into the future just as truly as do educational or governmental policies, building on the past, plan for future contingencies. The teacher or student of history, who confines himself to the event alone, fails even to reach the entrance to this field, broad as the world, and varied in its display as humanity itself.

The sources of history are multitudinous. Second-hand material is in abundance in texts, in extended works on historical subjects, in treatises on intellectual and social development, in books on geography, political economy, commercial law, government, and kindred subjects. Original material is available in public and private documents, messages, reports, speeches, addresses, proclamations, debates, national statutes, state enactments, city ordinances, newspaper accounts of events, newspaper caricatures, autobiographies, personal memoirs, individual diaries, camp notes, tourists' journals, photographs, monuments, historic places, relics, curios, private historic collections, state historical museums, individuals living, who have participated in great movements, or who have created, fostered, or furthered new ideas, etc.

The practical advantages to be derived from the study of history are these:—It develops the social instinct; it presents the true status of the business life; it records man's successes and failures in the field of government, and to young and old, in unmistakable terms, it points out the true standard of noble living. By the study of the social instinct, laws of society are discerned and amplified. Imitation is natural to all. Since history records no achievements of hermits, no benefits to the human race from anchorites, children and adults readily catch the meaning of associated effort. By the study of history are seen the exact effects of organized business enterprises, pursuing well-defined policies, and as affected by exterior influences. Often this study furnishes the only opportunity for the boy or girl to see the relation of cause and effect in business before becoming an actual participant in the business world. Our form of government makes it particularly desirable that every member of the body politic should be conversant with the history of his own nation at least. The statesmen of to-morrow are the students of to-day. A principle of government which yesterday proved inadequate to our advanced stage of civilization should be given no consideration whatever in the future. From what source can the future promoter of national prosperity get wisdom prior to his entrance upon the experimental stage better than from a study of the successes and failures of his predecessors? The ethical value of historical study is found in the careful analysis of the motives prompting action. In every case, such an analysis forces an historical judgment both as to effect—loss or gain, success or failure, static or dynamic—and as to means used—deceit or honesty, right or wrong, partisan or statesmanlike. With each historical judgment, the student's ethical ideals take more definite shape.

The method of historical presentation has been thoroughly revolutionized in the last few years, as has the conception of what constitutes historical material. It is now handled as a thing of life, full of personalities, having an immediate connection with *here*, and *now*, and *me*. It has something for the kindergartner, as well as for the bank president, college professor, or diplomat. Interest may be aroused at once in young and old by a study of local history and traditions. What New Englander or what dweller upon the historic Hudson or the Ohio, or what inhabitant of that once far-famed great American desert, or what citizen of that wonderful country beyond the Rockies, but must feel his heart swell with pride as he listens to the stories of adventure, of sacrifice, of marvelous discoveries, and of wonderful achievements, which once occurred in the locality about his home. How natural the transition from such a starting-point to the investigation of institutional life itself. A boy lives near the old Kansas home of John Brown. He learns the story of that man's life in Kansas. He is naturally led to the study of the institution of slavery. This involves the study of how slavery was introduced; what conditions of soil and climate gave it territorial location; what industries best utilized it; what peoples found it to their interest to maintain it; what conditions were necessary to perpetuate it; how it came to be a moral question; from what sources and why arose the first antagonism to it; the development of this opposition; constitutional questions involved; great men and women connected with the struggle; the great civil strife; resulting conditions; present grave questions pending solution. With the boy's interest in John Brown's old home as a basis, he may be led to the consideration of the gravest questions, economic, social, governmental, and ethical, with which our nation has ever been confronted. It matters not whether the boy's or girl's interest is first aroused by Plymouth Rock, Wall Street, Old Vincennes, Sam Houston, or Sutter's Mill, the same general method of inquiry will naturally follow. It will embrace the beginnings of things, causes, motives, external conditions, development, leading events, failures, successes, present condition.

In directing such investigation, the teacher may find it to his advantage to assign the topics for the day's work in some good text, but there should be free consultation of other authorities. Every class room should be supplied with reference books, maps, charts,

pictures, etc., illustrative of historical topics. If the maps and charts needed are too expensive to be purchased, they can be easily made. Several yards of white drilling, and a box of Dove drawing crayons, or a similar amount of flexible blackboard and a bottle of white ink, or some heavy manila paper and oil paints, *plus* an energetic teacher, will soon put at the pupil's disposal an abundance of exceedingly valuable and helpful maps and outlines. An active boy, a sharp jackknife, and a cigar-box may furnish some article illustrative of "Ye olden time," and fulfill more than one educational maxim. In this day of stencils, penny pictures, and newspapers, a teacher with a pair of scissors and the passe-partout picture binding, will easily provide the history classes with an abundance of illustrative material. The colored charts which appear in this volume will be found, it is believed, exceedingly helpful in fixing in the mind the landmarks of history, in their sequence and contemporary relations.

The fairy tale and the mythical story, which have so long served to quicken the imagination and introduce the child to literature, are now being partly displaced by the stories of real life which give him a taste for the study of history. Biography in the story form, well selected, logically related, and entertainingly presented, is the proper historical work for the lower grades. All periods of history should be drawn upon, particularly those periods which furnish characters living simple lives, making great sacrifices, performing deeds of heroism, and coming somewhat within the range of the child's own experiences and understanding. Certain ethical ideals, positive and negative, should control the selection of historical personages for the children, and their presentation should stimulate criticism, and the development of ethical as well as historical judgment. Tact and enthusiasm will give these stories even more interest for the children than the fairy tale, for they love to learn that the story is true. It is a mistake to ignore what may appear to us to be commonplace elements in biography, for they are often the very means by which the children's interest and understanding are aroused, and it is out of them that they build the fabric of history, even as from them the more complex life of succeeding civilizations has arisen. In the higher grades, this biographical study should gradually assume a more exhaustive and systematic form. As the child may be able to take an interest in institutional history, the origin and growth of the various social, industrial, commercial, educational, and civil institutions, particularly of those more nearly touching his every-day life, should be introduced. Biography gradually begins to get signification in institutions, and as early as in the seventh grade the two should merge into a connected historical study, completing a general view of the development of one's own country in the eighth grade. American history should not be considered as completed, however, in the eighth grade. It should be the crowning historical work of the senior year in the high school. Ancient, mediæval, and most of modern history, chronologically and logically precedes the larger view of American history, which should be given to every American youth.

A few suggestions may well be kept in mind: Especially in historical presentation, never tell the pupil what he can work or think out for himself. This applies equally well to reviews, daily recitations, or speculative work with facts in hand.

Use dates simply as pegs upon which to arrange facts of historical knowledge. Treat events as merely the vehicles which bear the precious freight of life, and thought, and character of the people. The event is the shell, the real thing is *in* it. The event is but the form, the content or contained idea is what the pupil should obtain and with which he should deal. Let the event always precede the date. Pupils should be incited, even forced, to think. The teacher should be a continuous question mark of why and what for. After the what and when should always follow the pupil's opinion as to why it is thus and so. With such a method as this, the pupil will find no profit in the old-time method of memorizing his history lessons and repeating them like a parrot or a phonograph, as the teacher may turn the crank.

Make use of the dramatic element in history. It serves the double purpose of maintaining interest and of making things seem more real, two very certain essentials in this subject.

Teachers should be sure to be far in advance of their brightest pupil. They should always be able to add to the sum total of the class recitation. Each day every pupil should carry away some new thought upon which to feed. The student who knows something well, thinks independently, and possesses ability to express himself clearly and forcibly, has attained that equipment which will enable him to serve well his day and generation.

The following books on matter and on methods of teaching history will make a royal little library for the teacher's study or the schoolroom:—

Methods:

Mace — *Method in History.*

Hinsdale — *How to Study and Teach History.*

Hall — *Method of Teaching and Studying History.*

McMurry — *Special Method in Literature and History.*

Channing and Hart — *Guide to American History.*

Matter:

Texts.

Channing — *Students' History of United States.*

CHART I.

B. C	Hebrew Nation.	Egypt.	Greece.
	2350. The Flood.		
	1921. Call of Abraham.		
	1728. Joseph sold into Egypt.		
	1706. Jacob removes into Egypt.		
	1574. Aaron born.		
	1571 Moses born.		
	1491. Exodus from Egypt.	**Cheops**, who built the great pyramid.	
	1491. The Law given on Sinai.		
	1451. Moses died.		
	1451. Joshua leads Israel into Canaan.		
	1300. Judges rule Israel for 300 years.	1350. Sesostus conquers Asia	
	85. Deborah judges Israel.		Fabulous.
	45. **Gideon** slaughters Midianites.		63. Jason and the Argonauts. Birth of Hercules.
1200			
	88. Jephthah.		
	56. Eli judges Israel.		94. Trojan war begins.
	37. **Sampson.**		84. Troy taken.
	20. **Samuel.**		
1100			
	95. **Saul** anointed King.		
	55. Slain by the Philistines.		69. Codrus, last king of Athens, died.
	55. **David** reigns.		
	43. He subdues the Philistines, Ammonites and Syrians.		68. Archons chosen instead of kings.
	23. Absalom revolts and is slain.		43. Ionians settle in Asia.
	15. **Solomon** King.		
	4. Temple dedicated.		
1000			
	75. Solomon died.	78. **Shishak**, builder of second pyramid.	
	75. Rehoboam reigns.		**Amphyctionic Council**, composed of representatives of principal Greek States, is made the court for settling inter-state disputes.
	75. Ten Tribes revolt under Jeroboam.	71. He conquers Judea, takes Jerusalem and plunders the temple.	
	Judah. / **Israel.**		
	58. Abijah defeats Jeroboam. / 75. Jeroboam I.		
	55. Asa, a pious king. / 54. Nadab.		
	4. Jehoshaphat. / 26. Samaria built.		Hesiod, poet.
	18. Ahab and Jezebel.		
900			
	89. Jehoram. / **Elijah** the prophet.		
	88. Jerusalem plundered by Philistines. / 88. **Elisha** the prophet.		**Homer**, the greatest of Greek poets.
	78. Joash. / 84. Jehu.		
	40. Slays Zechariah, priest. / 40. Jehoash; he defeats Benhadad, king of Syria.		80. Lycurgus, "the Spartan Lawgiver."
	26. Jerusalem taken by Jehoash.		
800			

B.C.	Judah.	Israel.	Assyrian Empire	Greece.	Rome.
	Uzziah.	Jonah the prophet		CHART II.	
	Joel the prophet.	84. Anarchy.			
	Amos the prophet.	47. Invasion of Tiglath Pileser.	47. Tiglath-Pileser.		
	59. Jotham.	30. Hosea: pays tribute to Shalmanezar.	28. Shalmanezar.		
	42. Ahaz: made tribute to Tiglath-Pileser.			76. **Epoch of the Olympiads** from which the Greeks reckoned time.	53. **Rome** founded by Romulus.
	26. **Hezekiah.**				15. Numa Pompilius.
	Isaiah the prophet.	21. The ten tribes carried captive to Assyria.		46. Austomenes last king of Corinth.	8. Tarentum founded.
	Nahum the prophet.				
	10. Sennacherib destroyed.		9. Esarhaddon.		
700					
	97. Manasseh.	**Babylonian Empire.**			
	42. Amon.				
	41. Josiah.				
	Jeremiah the prophet.	Esarhaddon reigns at Babylon.		85. 2nd Messenian War.	72. Tullus Hostilius.
	Zephaniah the prophet.	He plants colonies in Samaria whose descendants are called Samaritans.		24. Bloody code of Draco.	40. Ancus Martius; he subdues the Latins.
	Habakkuk the prophet.			Sappho, poetess.	
	6. Jerusalem taken by Nebuchadnezzar.	**Nebuchadnezzar**: he defeats Necho of Egypt, and takes Jerusalem.		Ascendency of Sparta.	16. Tarquin the elder.
600					
	98. Jehoiachin.				
	96. Zedekiah.			94. **Solon**, the Athenian Lawgiver.	78. Servius Tullius.
	88. Jerusalem destroyed.	Nineveh destroyed by Nebuchadnezzar.		62. Comedies first exhibited at Athens.	
	Ezekiel the prophet.			60. **Pisistratus.**	
	Jews carried captive to Babylon.			**Thales**, founder of Ionic Philosophy.	
	61. Evilmerodach.			60. Temples built.	
	60. Neriglissar.				
	55. Belshazzar.			34. Thespis exhibits Tragedies first at Athens.	34. Tarquin the proud.
	38. Babylon taken by Cyrus the Mede, who establishes the	**Medo-Persian Empire.**			9. The **Republic.**
	36. Cyrus' decree restoring the Jews.			**Pythagoras**, philosopher	Consuls chosen.
	21. Darius.			10. Hippias expelled.	1. Dictatorship created.
	Zechariah the prophet.				
	Haggai the prophet.				
	15. Second Temple dedicated.				
500					
	94. Darius invades Greece.			Anacreon, poet.	
	90. His army defeated at Marathon.			91. Death of **Thucydides**, historian.	93. Tribunes chosen.
	85. **Xerxes** the Great.			90. Miltiades defeats the Persians at Marathon.	82. Coriolanus.
	81. He invades Greece.			80. Xerxes defeated at Thermopylæ.	56. **Cincinnatus** dictator.
	80. He returns defeated.			79. Persians defeated at Platæa.	51. Laws of the Twelve Tables.
	67. **Ezra** returns to Jerusalem.			**Æschylus**, poet.	
	64. Artaxerxes I. or Ahasuerus.			64. 3rd Messenian War.	Decemvirs appointed.
	56. He makes Esther Queen.			45. **Herodotus**, historian.	
	55. **Nehemiah** re-builds Jerusalem			31. Peloponnesian War.	45. Military Tribunes created.
	Malachi, last of Old Testament writers.			29. Death of Pericles. Euripides, poet. Sophocles, poet.	
				Socrates, the great moralist.	
400					

B. C.	Medo-Persian Empire.	Greece.
		95. Corinthian War begins.
	Artaxerxes Mnemnon.	80. Olynthian War.
		78. Theban War.
	Cyrus Revolts.	71. Battle of Leuctra.
		63. Battle of Matineia.
	Is slain at the battle of Cunaxa.	61. Death of Hippocrates.
		51. Death of Xenophon, historia
		48. Death of Plato, philosopher.
		38. War with Macedon.
	36. Darius Codomanus.	38. Battle of Chæronea: Philip v

Macedonian Empi

36. Alexander the Great.	35. Con
34. Invades Persia. Battle of Granicus.	33. Batt
32. Conquers Egypt and Tyre.	32. Alex
30. Battle of Arbela. Persia subdued,	28. Defe
23. Alexander dies at Babylon.	

300

At the death of Alexander, the Macedonian Empire was divided into numerous States.

Egypt.	Judea, subject to Egypt.	Syria.
Ptolemy Lagus, Alexander.	Founds Library of	Seleucus.
		83. Antiochus I.
84. Ptolemy Philadelphus.		46. Seleucus II.
46. Ptolemy Everget es.		26. Seleucus III.
21. Ptolemy Philopater.		23. Antiochus the Great.
4. Ptolemy Epiphanes.		
200		
	Antiochus takes the Egyptians.	Judea, and repels
80. Ptolemy Philometer.		75. Antiochus IV.
	65. Judas defeats An	tiochus.
	35. John Hyrcanus	frees Judea from
45. Ptolemy Physcon.	power of Syria.	
		30. Antiochus VII.
	6. Aristobulus.	23. Antiochus VIII.
17. Ptolemy Lathyrus.	5. Alexander Jannæus.	12. Antiochus IX.
100		
		95. Antiochus X.
	70. Hyrcanus II.	92. Antiochus XI.
Ptolemy Alexander.	67. Aristobulus II.	87. Antiochus XII.
		69. Antiochus XIII.
	66. Pompey subdues Syria and Judea.	
65. Berenice, Queen.	60. First Triumvirate—Pompey, Crassus and C	
	55. Cæsar invades Britain.	
	48. Civil war between Cæsar and Pompey.	
45. Cleopatria.	47. Battle of Pharsalia; Pompey defeated.	
	45. Cæsar Dictator.	
	43. Second Triumvirate—Octavius, Anthony an	
30. Egypt subdued.		

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B. C.

CHART IV.

	ADVENT.	
	Augustus died.	17. **Livy,** historian, died.
	Tiberius Emperor.	25 Strabo, historian, died.
59.	Caligula.	65. **Seneca,** philosopher, put to death by Nero
42.	Claudius.	79. Pliny the elder died.
	Nero.	79. Herculaneum and Pompeii destroyed by eruption of Vesuvius.
26.	Vespasian.	81. Agricola conquers Britain.
	Jerusalem destroyed.	97. **Quintilian,** orator and writer, died.
	Titus.	97. **Josephus,** Jewish historian, died.
	Domitian.	
10.	Trajan.	
700		
	Hadrian, surnamed the best.	15. Pliny the younger died.
97.	He re-builds Jerusalem.	20. **Plutarch,** biographer, died.
42.	**Antoninus Pius.**	28. Juvenal, poet, died.
41.	**Marcus Aurelius.**	35. **Tacitus,** historian, died.
	Commodus.	
	Septimius Severus.	
	Caracalla and Geta, sons of Severus.	
	Heliogabalus.	
6.	Alexander Severus.	**Tertullian,** an able defender of Christianity, originally a pagan.
	Claudius II.	
600		
	Aurelian; he defeats the Goths and Germans.	54. **Origen** suffers martyrdom.
98.		
96.		
88.	Diocletian.	
	Constantine the Great.	
	Seat of Empire removed to Constantinople.	
	Julian the Apostate.	16. Arius.
61.		
60.	Empire divided.	
55.	Valentinian Emperor of the West.	
38.	Valens of the East.	25. Council of Nice.
	Theodosius the Great, reunites the Empire.	35. Athanasius, bishop of Alexander, exiled
36.	Empire permanently divided.	
21.	Arcadius Emperor of the West.	
	Honorius of the East.	
15.		
500		
	Alaric the Goth invades Italy	
	Invasion of Spain by the Vandals, Alians, and Suevi.	
94.		
90.	Alaric sacked Rome.	
85.	Attila the Hun defeated.	7. **St. Chrysostum** died.
81.		
80.	Rome plundered by the Vandals under Genseric.	
67.		30. **St. Augustine** died.
64.	Romulus Augustulus, last Emperor of Rome.	
56.		
55.	Roman Empire overthrown by Odoacer, King of the Heruli.	
400		

t deemed necessary to represent the next five centuries by Charts, as little or no progress was made in intellectual or national life during that period.

CHART V.

A. D.	England.	France.	Germany.	Various Countries.
1000	2. Massacre of St. Brice. 13. **Danish Kings.** 17. Canute I., the Great. 39. Canute II. 41. **Saxons Restored.** Edward the Confessor. 44. Common Law Established. 66. **Norman Kings.** William the Conqueror.	Robert II. Son of Hugh Capet. 31. Henry I. 60. Philip I. Invasion of William the Conqueror. 96. First Crusade.	2. St. Henry. 24. Conrad II. 39. Henry III. 56. Henry IV. 73. War with Saracens begins.	35. Kingdom of Aragon. 54. Schism or Separation of the Greek Church from Rome. 65. Turks take Jerusalem. 73. War of Investitures. 73. Hildebrand becomes Pope Gregory VII.
1100	Henry I. Usurper. 54. Henry II. **House of Plantagenet.** 71. Ireland Subdued. 89. Richard I. Cœur de Lion.	8. Louis VI., the Fat. 37. Louis VII. 46. Second Crusade. 80. Philip II. 87. Third Crusade. 94. Fourth Crusade. Abelard, Scholastic Philosopher.	6. Henry V. 38. Conrad III. 52. Frederic I. (Barbarossa) invades Italy. 63. Berlin founded. 95. Two Sicilies acquired.	Crusaders take Jerusalem. 25. Venetian Wars. 59. Alexander III. Italy. 71. Saladan, Sultan of Egypt. 94. Innocent III., Pope.
1200	15. The Magna Charta Signed. 16. Henry III. 62. The Barons' War. 65. Barons defeated by Edward at Eversham. 72. Edward I. 82. Wales Conquered. 84. Title Prince of Wales created.	8. Albigensian Crusade. 23. Louis VIII. 26. Louis IX. 28. Sixth Crusade. 45. Seventh Crusade. 70. Eighth Crusade. 85. Philip IV.	8. Otto IV. 12. Frederic II. 41. League of Hansetowns. 73. **House of Hapsburg.** Rodolph I.	4. The Inquisition instituted. 15. Doctrine of Transubstantiation and Auricular Confession established. 18. Genghis Khan, Mogul, subdues Persia. 29. Laity prohibited from reading the Scriptures 38. Kingdom of Granada. 65. Dante born. 82. Sicilian Vespers.
1300	7. Edward II. 14. Battle of Bannockburn. 27. Edward III. 28. Chaucer Born. 46. Battle of Crecy. 56. Battle of Poictiers. 77. Richard II. 84. John Wickliffe died. 99. Henry IV. **House of Lancaster.**	16. Philip V. 28. Philip VI. **House of Valois.** 45. Dauphiny annexed. 64. Charles V. 80. Charles VI. Froissart, historian.	7. William Tell. Switzerland revolts. 9. Henry VII. 30. *Gunpowder invent'd.* 38. German Princes deny the temporal power of Pope. 49. Charles IV. 56. He issues the "Golden Bull."	8. Popes removed to Avignon. 11. Knights Templars abolished. 21. Dante died. 74. Petrarch died. 87. Margaret, queen of Denmark and Norway. 95. Tamerlane in Russia.
1400	13. Henry V. Wars with France. 15. Battle of Agincourt. 22. Henry VI. 53. War of Roses. 61. Edward IV. **House of York.** 83. Richard III. 85. Henry VII. **House of Tudor.**	22. Charles VII. 29. Joan of Arc at Orleans. 30. She is burned by the English. 51 The English driven from France. 61. Louis XI. 85. Charles VIII.	15. Council of Constance. John Huss burned. 31. **House of Austria.** 35-58. *Printing invented.* 83. Martin Luther born.	Tamerlane overran Syria. House of Medici in Florence. 53. Constantinople taken by Turks. Isabella and Ferdinand unite Castile and Arragon. 92. Columbus discovers America.
1500	9. Henry VIII. 13. Battle of Flodden. 33. Henry divorces Catherine and marries Anne Boleyn. 36. Beheads Anne and marries Jane Seymour. 47. Edward VI. Cranmer. 53. Bloody Mary. 58. Elizabeth reigns. [lished. 64. Church of England Estab- Puritan party formed. 87. Mary Queen of Scots beheaded.	Louis XII. 15. Francis I. 47. Henry II. 59. Francis II. 62. Huguenots' War. 64. John Calvin died. 72. Massacre of St. Bartholomew. 74. Henry III. 89. Henry IV. **House of Bourbon.**	16. Luther begins the Reformation. 19. Charles V. 21. Diet of Worms. 30. Augsburg Confession. 56. Charles abdicates. Ferdinand I. chosen Emperor.	4. French in America. 13. Leo X., Pope. 13. Ponce de Leon in Florida. 21. Wars of Charles V. in Italy. 32. Pizzarro conquers Peru 33. Ivan IV. of Russia. 35. Order of Jesuits founded. 36. Cortez conquers Mexico. 56. Philip II. of Spain. 89. Frederick II. of Denmark.

CHART VI.

A. D.	England.	France.	Prussia and Germany.	Various Countries.
1600	3. James I.			9. Arminius, divine, died.
	House of Stuart.	10. Henry IV. murdered.	18. Thirty Years War begins.	
		10. Louis XIII.		11. Gustavus Adolphus of Sweden.
	11. Translation of Bible.		20. Battle of Prague.	
	16. **Shakspeare** died.	20. Navarre annexed.		
	25. Charles I.		30. **Kepler** died.	42. **Galileo** died.—Italy.
	26. Sir Francis Bacon died.	29. Cardinal Richelieu.		
	49. Oliver Cromwell.	43. Louis XIV.	32. Battle of Lutzen.	44. Christina crowned.
	The Commonwealth.	48. Wars of the Fronde.		
		50. Des Cartes died.	40. Frederick William the Great.	62. Catherina II. of Russia.
	60. Stuarts restored. Charles II.	85. Edict of Nantes revoked.		89. **Peter the Great of Russia.**
	79. Habeas Corpus Act.		48. Peace of Westphalia	
	85. James II.			
	88. William Prince of Orange. Milton. Locke.	97. Peace of Ryswick.	78. Peace of Nimuegen.	97. Charles XII. of Sweden.
1700	2. War with France.	15. Louis XV.		12 St. Petersburg founded.
	13. Peace of Utrecht.		4. Battle of Blenheim.	
	14. George I.	38. Peace of Vienna.	13. Peace of Utrecht.	25. Catherine I. Russia.
	House of Brunswick.	48. Peace of Aix-la-Chapelle.	14. Peace of Rastadt.	27. Elizabeth.—Russia.
	27. George II.	56. War with England.	22. Pragmatic Sanction.	
	27. Sir Isaac Newton died.	63. Peace of Paris.	40–48. War of the Austrian Succession.	33. War between France and Poland.
	29. Rise of Methodists. Wesley and Whitfield.	74. Louis XVI.	40. **Frederic II.**, the Great.	69. Clement XIV.
	39. War with Spain.	78. Voltaire died.	41. Charles the VII.	
	46. Charles, son of Pretender, defeated at Culloden.	83. Peace of Versailles.	45. Francis I.	96. Napoleon invaded Italy
	56. War with France.	89. States General.	56. Seven Years War begins.	97. Peace of Campo Formio.
	56. Chatham, Prime Minister.	**The Revolution.**	65. Joseph II.	
	60. George III.	93. Republic declared.	92. Francis II.	
	75. War with United States.	**Reign of Terror.**	97. Frederic William III.	98. Pius IV. deposed by Napoleon.
	93. War with France.			
	94. Gibbon, historian, died.	95. The Directory.		
	96. Robert Burns died.	97. The Consulate.		
	97. Edmund Burke died.			
1800	Ireland united to Great Britain.	4. **Bonaparte** Emperor.	6. Battle of Jena.	4. Francis II. of Austria.
	5. Battle of Trafalgar.	12. Invades Russia.		5. Battle of Austerlitz.
	7. Slave Trade abolished.	13. Battle of Leipsic.		12. War with Russia.
	8. Peninsular War.	14. Louis XVIII.		13. War with France.
	12. **War with United States.**	15. **Waterloo.** Napoleon overthrown.	16. Germanic Confederation.	15. Netherlands united.
	14. Peace with France.	30. Louis Philippe.		26. Nicholas.—Russia.
	15. War with Napoleon renewed.	35. Death of Lafayette.	10. Frederic William IV.	30. Belgium independent.
	20. George IV.	47. Revolution. Louis Philippe abdicates.		48. Hungarian War.
	29. William IV.	48. Republic.		**Francis Joseph.**
	32. Sir Walter Scott died.	52. **Napoleon III.**, Emperor.		49. Victor Emanuel II.—Italy.
	37. **Victoria** crowned.	70. War with Prussia. Napoleon surrendered at Sedan.		55. Alexander II.—Russia.
	54. Crimean War.	71. **The Republic.** Thiers, President.	59. War with Italy and France.	
	56. War with Persia and China.	73. Napoleon III. died.	61. **William I.**	51. Russian Serfs Emancipated.
	57. Mutiny in India.	94. President Carnot assassinated.	66. North German Confederation.	66. War with Prussia.
	66. Atlantic Cable laid.		66. War with Prussia.	77. War between Russia and Turkey.
	67. Fenian troubles.		70. War with France.	81. Alexander II. assassinated.
	67. War with Abysinnia.		71. King William proclaimed Emperor of Germany.	81. Alexander III. Russia.
	72. Conference of Geneva		72. Jesuits expelled from empire.	91. Famine in Russia. Jews expelled.
	78. Afghanistan War.		88. William I. died. Mch. 9.	94. China-Japan War.
	82. War in Egypt.		88. Frederick III. died July 15.	96. Nicholas II.—Russia.
	97. Queen's Diamond Jubilee.		88. William II. becomes Emperor.	98. Spanish-American War
	98. Gladstone died.		98. Bismarck died.	
	99. Boer War.			
1900	00. Boer War continued.	00. Paris Exposition.		00. Partition of Samoa.
				00. Boxer rising in China.
	01. Victoria died.			00. King Humbert, Italy, assassinated
				00. Victor Emanuel III., Italy.
	01. Edward VII.			01. Australian federation.

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M. A. W.

METHODS IN ARITHMETIC. — Mathematics is the science of quantity.

Quantity is any thing that is capable of increase or decrease, as a line, surface, volume, weight.

Quantity is of two kinds — magnitude and multitude. Quantity of magnitude is quantity in an undivided form, as water, grain, earth, hence man has invented various units with which to measure it. This gives rise to a system of weights and measures and furnishes a subject for mathematical operation usually called denominate numbers. Quantity of multitude is quantity in a divided form, as trees, rivers, apples, houses, the units of which may be natural or artificial.

Arithmetic is a branch of mathematics. It is one of the oldest and purest products of the human mind. Arithmetical ideas are among the first that enter the human mind and they are so interwoven with all forms of human thought and action, that the history of arithmetic and its development cannot be separated from the development of the human race.

Arithmetic is the science of numbers and the art of computation. Science is knowledge classified in accordance with some fundamental principle; hence the science of numbers consists of the principles and relations of numbers. Computation is the application of the principles of arithmetic to individual examples.

All numerical ideas begin with the unit, hence the unit is the basis of the science of numbers. All numbers originate with the unit. The unit may be multiplied or divided. If multiplied the result is an integer, — if divided, the result is a fraction. Therefore numbers are of two kinds, integers and fractions. The process that originates integers is synthesis and the process that originates fractions is analysis. All other operations are modi-

fications or variations of synthesis and analysis — the two fundamental processes — and are mechanical. If numbers are examined in order to determine whether to add, subtract, multiply, or divide, the process is called comparison and is a thought process.

The operations of synthesis are addition and multiplication. The operations of analysis are subtraction and division. The operations of comparison are ratio, proportion, progression, percentage, and properties of numbers.

Notation and numeration, addition, subtraction, multiplication, and division are called the *fundamental rules of arithmetic.*

Notation and Numeration is the art of writing and reading numbers. The young pupil must learn small numbers by handling objects. He must learn the number, the name of the number, and the character which represents it. Sticks, grains of corn, marbles, or any other articles may be used but sticks of wood are the most convenient. The teacher may present a number of sticks and ask the pupil for the number and the character which represents it, or the teacher may call for a certain number and the pupil will present the sticks corresponding to it. After the pupil has learned the numbers to 10, bundles of sticks of ten each may be formed. The numbers from 11 to 99 may then be learned as 1 ten and 1 stick, 1 ten and 2 sticks, 2 tens and 7 sticks and so on. Bundles of 100, bundles of 10, and loose sticks may be used to represent numbers from 100 to 999. After a reasonable time the pupil must learn to image numbers. The only way to learn to image numbers is to image them.

After a certain stage of advancement in mathematical knowledge it became necessary to adopt a system of writing numbers. Any number might have been chosen as a basis of a system of numbers. Since man has 5 fingers on one hand, 10 on both hands, and 20 fingers and toes, it was natural that these numbers should be chosen as a basis of a system of notation, and in various parts of the world all of these numbers have been so used. During the lapse of ages it has been a question of the survival of the fittest, and at the present time 10 is almost universally used.

After the pupil has learned the numbers to 999 by the use of objects, he must learn to represent large numbers by the decimal notation.

By the common method the number to be read is separated into periods of three figures each, 693687946875 is read 693 billion, 687 million, 946 thousand, 875. This method is the only method in use at the present time.

To write numbers: write a period; write a comma in place of the name of the period; fill vacant periods with ciphers. To read numbers: begin at the right and separate into periods; name the periods in the same order; begin at the left and read the periods.

Addition, the fundamental synthetic process in arithmetic, is the process of finding the sum of two or more numbers. The sum of two or more numbers is a single number expressing as many units, fractional or integral, as there are units in all the numbers added. Numbers of the same denomination only can be added. The sum is of the same denomination as the numbers added. The sum is the same in whatever order the numbers are added.

There seems to be two distinct stages in the study of addition. The primary stage is the period when the addition table is built up by counting process. In this stage small numbers are used, with no reference to a system of notation by which to write large numbers. The work is purely mental and might properly be called *pure* arithmetic.

In the first stage, by counting objects the pupil obtains the primary sums of arithmetic, or the addition table.

For example, if he wishes to find the sum of 5 sticks and 4 sticks he begins with 5 sticks adds by ones, or counts, until he uses 4 more sticks. He finds the result to be 9 sticks and henceforth he must remember that $5 + 4 = 9$. The primary sums can hardly be said to be determined by the aid of reason but are intuitive rather. Why does $3 + 3 = 6$, $3 + 3 = 4 + 2$, or $5 + 1$? There is no reason for it. The learner looks at $3 + 3$ and sees that the sum is 6, $4 + 2$, and $5 + 1$.

After the pupil has learned the 45 combinations or primary sums by the use of objects, he proceeds to add larger numbers and continues the use of objects. For example let it be required to add 27 and 36. The numbers are written on the board

$$\begin{array}{r} 27 \\ \underline{36} \end{array}$$

and 2 bundles, of 10 each, with 7 sticks are laid upon the table and below them 3 bundles and 6 sticks. The pupil proceeds to unite the 7 sticks and 6 sticks, and finds that he can make one bundle of 10 and have 3 sticks left. He then puts the bundles of 10 together and finds that he has 6 bundles of 10 and 3 sticks. He expresses the result as 63. This process may be continued into hundreds, but only so long as it may be necessary to give the pupil a clear understanding of the process. He must then *image* his magnitudes.

In the second stage, the learner must be taught to perform addition of numbers expressed in the Arabic notation. When he learned the primary sums he learned to express them with figures and now it is an easy transition to the expression of larger numbers.

For convenience, write the numbers to be added so that units of the same order may stand in column. Add each column separately, beginning with units in order that sums may be reduced to higher orders.

Let it be required to add 628, 867, 943, and 785.

The work will appear as follows: —

628
867
943
785
3,223

Explanation.— The sum of the units is 23 units, or, 2 tens and 3 units. Write the units in units' column and add the tens to the tens' column. The sum of the tens is 22 tens or 2 hundreds and 2 tens. Write the tens in the tens' column and add the hundreds to the hundreds' column. The sum of the hundreds is 32 hundreds, or 3 thousands and 2 hundreds. Write the hundreds in hundreds' column and the thousands in the thousands' column. Therefore the sum of the numbers is 3,223.

Form of Analysis.— A pencil costs 5c, a slate 10c, and a book 8c. What is the cost of all?

Analysis: All will cost the sum of 5c, 10c, and 8c, or 23c.

Subtraction is the fundamental analytic process of mathematics. Every synthesis must have, or at least implies, a corresponding analysis, hence subtraction may be said to be the process of finding the difference between two numbers. The difference between two numbers is the number which must be added to the smaller that the result may equal the larger. The question: "What is the difference between 9 and 5," is equivalent to the question: "What must be added to 5 that the result may be 9?" No subtraction table as such should be taught, but the learner should find results by the addition table. When he learns that 5+4=9, he learns that 9–5=4, and 9–4=5. The number to be diminished is the minuend. The number to be subtracted is the subtrahend. The result is the difference, or remainder.

As in addition, subtraction may have two stages. The first stage consists of finding the primary differences, which is *pure* arithmetic independent of any system of notation.

The use of sticks should be continued in subtraction. Let it be required to find the difference between 63 and 27. Write the numbers

63
27

Put down 6 bundles of 10 and 3 sticks and ask the pupil to take away 2 bundles and 7 sticks. He sees that he must break one bundle, that he then has 13 sticks, and that he now can take away 2 bundles and 7 sticks, thus leaving 3 bundles and 6 sticks, which he expresses as 36.

The second stage is the process of finding the difference between two numbers when the numbers are expressed by the decimal notation. Principles to be emphasized: 1. Only numbers of the same denomination can be subtracted. 2. The remainder must be of the same denomination as the minuend and subtrahend. 3. Equal numbers may be added to or subtracted from both minuend and subtrahend without altering the value of the remainder. 4. The minuend equals the sum of remainder and subtrahend and the subtrahend equals the difference between minuend and remainder.

Rule.— Write the subtrahend under the minuend, placing units under units, tens under tens, and so on. Subtract each figure of the subtrahend from the figure directly over it and place the remainder beneath. If the lower figure exceeds the upper figure, add to the upper figure one of its units of the next higher order. Subtract, and proceed as before.

Example.— From 67321 subtract 39586.

The work will appear as follows: —

67321
39586
27735

Explanation.— 6 units cannot be subtracted from 1 unit. 1 of the tens added to the 1 unit = 11 units. 6 units from 11 units leaves 5 units. 8 tens cannot be subtracted from 1 ten. 1 of the hundreds added to the 1 ten = 11 tens. 8 tens from 11 tens leaves 3 tens, and so on.

Form of Analysis.— John had 13 marbles and lost 6 of them. How many had he left?

Analysis: He had left the difference between 13 marbles and 6 marbles, or 7 marbles.

Multiplication is a short process of making several additions of the same number, hence it is a special form of addition. The multiplicand is the number to be added. The multiplier is the number which shows how many times the multiplicand is to be used as an addend. The result is called the product. By the aid of the addition table the learner builds the multiplication table which he uses in future calculations. In this work he continues the use of objects. Henceforth multiplication becomes a distinct process and, from its original meaning it may be defined as the process of taking one number as many times as there are units in another. This implies that the multiplier must be an integer. The multiplicand is the number to be multiplied. The multiplier is the number with which the multiplication is made. The result is the product. (In the course of time the notion of multiplication became extended so that the multiplier might take a fractional form, hence a new definition became necessary. Under this conception, multiplication is the process of finding a number which bears the same relation to the multiplicand that the multiplier bears to unity.

The multiplicand may be abstract or concrete, but the multiplier must always be abstract, for it always tells how many *times* the multiplicand is to be used as an addend. The product is always of the same denomination as the multiplicand. The old statement that "feet multiplied by feet give square feet" is pure fiction, and has no place in mathematical teaching.

Numerically, the product is the same in whatever order the multiplication is performed,—this is called the Commutative Law of Multiplication.

Rule.— For convenience, write the multiplier under the multiplicand. Beginning with units, multiply each figure of the multiplicand by each figure of the multiplier, placing the right hand figure of each partial product under the figure used as a multiplier. Add partial products.

The figures of the multiplier may be used in any order whatever. The explanation of multiplication is practically the same as in addition.

Form of Analysis.— If one hat cost $6, what will be the cost of five hats?

Analysis: If one hat cost $6, five hats will cost 5 times $6, or $30.

Division is a special form of subtraction, and may be defined as the process of making several subtractions of the same number. The number from which the subtraction is to be made is the dividend. The number to be subtracted is the divisor. The number of times the subtraction can be made is the quotient. Under this conception, the dividend may be abstract or concrete, the divisor must always be of the same denomination as the dividend, and the quotient must always be an abstract number.

In its broader application, division is the opposite of multiplication, hence it may be defined as the process of finding one of two factors when the product and the other factor are known. Then there must be two definitions of division, viz.: Division is the process of finding how many times one number is contained in another of the same kind, or, Division is the process of finding one of the equal parts of a number. No division table as such, should be taught. When the learner ascertains that $6 \times 5 = 30$, he knows that $30 \div 6 = 5$, and $30 \div 5 = 6$. In this work objects should be used until the process is clear to the pupil.

When the divisor is 12, or less, the division is performed mentally and results written, and the process is Short Division. When all of the work is written, the process is Long Division.

Under the extended meaning of division, there must be two forms of analysis.

Forms of Analysis.— 1st. Form: If one hat cost $6, how many hats can be bought for $30?

Analysis: If one hat cost $6, as many hats can be bought for $30 as $6 is contained times in $30, or 5.

2d. Form: If 5 hats cost $30, how much will one hat cost?

Analysis: If 5 hats cost $30, one hat will cost $\frac{1}{5}$ of $30, or $6, or, If 5 hats cost $30, one hat will cost $30 ÷ 5, or $6.

Fractions.— There are two conceptions of a fraction. A fraction is one or more of the equal parts of a unit, or, a fraction is an expression ot division with the dividend above and the divisor below a horizontal line. $\frac{3}{4}$ is read three-fourths or three divided by four. It means that a unit has been divided into four equal parts and three of them taken, or it is simply an unexecuted division.

Objects should be used freely in teaching fractions. Let it be required to explain the two conceptions of $\frac{3}{4}$ by use of objects. Divide three apples among 4 boys, A, B. C, and D. Cut $\frac{1}{4}$ out of each apple and give the fourths to A, and to each of the others give one of the remaining parts. A will have $\frac{1}{4}$ of 3 apples, while each of the others will have 3 fourths of one apple. Therefore $\frac{3}{4}$ means 3 of the 4 equal parts into which a unit may be divided, or it may mean $3 \div 4$. Use objects in showing that $\frac{1}{2}$ is $2 \times \frac{1}{4}$, to show that multiplying the numerator multiplies the fraction, and the truth of other related rules, and to show the reduction of fractions to equivalent fractions having a common denominator.

$\frac{3}{5\frac{1}{2}}$ is not a fraction by the first conception, and must be read $3 \div 5\frac{1}{2}$

Fractions are simple, complex, or compound. A simple fraction is a fraction having integral numbers for its terms. A complex fraction is a fraction having a fraction in one or both of its terms, as

$$\frac{6}{8\frac{1}{3}}, \quad \frac{\frac{3}{5}}{\frac{1}{4}}$$

A compound fraction is a fraction of a fraction, as $\frac{2}{3}$ of $\frac{3}{4}$.

Fractions are further classed as common and decimal. A common fraction is a fraction whose denominator may be any number, as $\frac{3}{4}$ $\frac{7}{10}$. A decimal fraction is a fraction whose denominator is 10, or some power of 10, as $\frac{7}{10}$, $\frac{9}{100}$. When a decimal fraction is written with the aid of a decimal point it is called simply a *decimal.*

Compound Numbers.—The rules and explanations of compound numbers are the same as in simple numbers. The learner memorizes the tables and these tables take the place of the decimal scale.

Ratio.—Ratio is an expression of division with the dividend before and the divisor after a colon.

A ratio has two terms—the antecedent and the consequent. These terms must be of the same denomination. Ratios may be simple, compound, or inverse. A simple ratio is a ratio whose terms are single numbers, either simple or compound. A compound ratio is two or more simple ratios considered as one, shown by a brace, as

$$\left.\begin{matrix} 3:4 \\ 2:5 \end{matrix}\right\}$$

An inverse ratio is a ratio with its terms interchanged. 3:4 is the inverse of 4:3. All principles of divison and fractions apply to ratios.

A proportion is an equality of two ratios. A simple proportion is a proportion having both of its ratios simple. A compound pro-

portion is a proportion having one or both of its ratios compound, as

$$\left.\begin{matrix}3:4\\2:3\end{matrix}\right\} : 1 :: 2,$$

$$\text{or } \left.\begin{matrix}2:3\\3:5\end{matrix}\right\} : : \left\{\begin{matrix}1:5\\6:3\end{matrix}\right.$$

Three terms must be given to find the fourth. The first and fourth terms are called the extremes, and the second and third are the means.

Law.—The product of the means equals the product of the extremes.

Rule.—Write for the third term the denomination required in the answer. If from the nature of the question the answer is larger than the third term, the larger of the other two should be placed for the second term, and the smaller for the first term. If the answer is smaller than the third term the other two should change places.

Example.—If 3 hats cost $15, what will be the cost of 7 hats?

Solution.—3 hats : 7 hats : : $15 : ×

$$\times = \frac{7 \times \$15}{3} = \$35.$$

Explanation.—Will 7 hats cost more than 3 hats? Yes. Then 3 : 7 : : $15 : ×

Percentage embraces all operations with per cent. *Per cent means hundredths.* This is the only thing new in percentage. Per cent may be expressed with the sign, %, as a fraction, and as a decimal. 6% = $\frac{6}{100}$ or .06. The operator should change the per cent to a fraction or a decimal to suit his convenience. The terms of percentage are base, rate, percentage, amount, difference.

The base is the number upon which the percentage is calculated. The rate is the number of hundredths to be taken. The percentage is the result obtained from taking the per cent of the base and is of the same denomination as the base. The amount is the base plus the percentage. The difference is the base minus the percentage.

Principles: $B \times R = P$. $\frac{P}{B} = R$, $\frac{P}{R} = B$.

$\frac{A}{1+R} = B$ $\frac{D}{1-R} = B$

Profit and Loss are commercial terms and are always some per cent of the cost.

Stock is the capital of a corporation invested in business. A bond is a corporation's promise to pay money at a specified time. Market value, premium, discount, assessment, and dividend are all some per cent of the par value.

Commission.—An agent buys and sells for his principal. If he buys, his commission is some per cent of what he pays for it. If he sells, his commission is some per cent of what he receives for it.

Taxes. Tax is money collected by law for public use. Taxes are of two kinds,—direct and indirect. All local taxes are direct and are some per cent of the assessed valuation. The assessed valuation is a fictitious value placed upon property for the purpose of taxation. It may be above or below the real value.

Interest is money paid for the use of money, and is some per cent of the principal or amount borrowed.

Simple interest is interest on the principal only.

Annual interest is interest on the principal and on the unpaid annual interest.

Compound interest is interest on the principal and on all unpaid interest.

Discount is a deduction from a debt due at some future time, made for present payment. True discount is the simple interest on the present worth of the debt. The present worth of a debt is the sum of money which, if placed at interest for the given time at the given rate, will amount to the debt. If the debt is drawing interest, the amount due at maturity is the sum to be discounted. If the debt *is a note* given in a state which allows days of grace, days of grace should be counted in finding the true discount. In all other cases no days of grace are counted unless so stated in the problem.

Bank Discount is interest on the face of the debt for the given time plus three days. If the debt is drawing interest, the amount due at maturity is the sum to be discounted. Always count days of grace unless otherwise stated in the problem, or unless the note is dated in a state not allowing days of grace.

General Method.—All method should lead to clearness of thought, and to accuracy and speed in applying principles to the solution of problems. The student must image magnitudes and relations accurately and the method should lead to this result.

How can a pupil be expected to find the volume or convex surface of a pyramid if the image of the pyramid fails to present itself to his mind? If a pupil lack this power to image a magnitude, he must be required to represent it by a drawing. Many pupils fail in arithmetic because they attempt to memorize definitions and processes and thus work mechanically.

To as great an extent as possible the work of the class room must be made practical. The pupils must measure magnitudes, compute lengths, areas, volumes. To a limited extent the work of the carpenter, plasterer, bricklayer, stone mason, paper-hanger, may be taught by requiring the pupils to compute the cost of the blackboard, and the cost of carpeting the floor, the cost of papering the room, plastering the room, building a barn. The teacher's duty is to put a thought into the mind of the pupil, by suggestion if possible, and make it grow in interest and power. All principles and definitions should be developed and all results proved.

Reference books: *Psychology of Number*, Dewey; *The Teaching of Mathematics*, Smith; *The Study of Mathematics*, De Morgan; *Elementary Mathematics*, Le Grange; *Solution Book*, Showalter; *Arithmetic Re-*

viewed, American Comprehensive Arithmetic, and *American Mental Arithmetic,* Bailey; *Philosophy of Arithmetic,* Brooks; *Mathematical Dictionary,* Davies and Peck; *History of Mathematics,* Cajori; *American Primary Arithmetic,* Bailey. E. L. P.

Ped'icel, the stalk of an individual flower. When a flower has no pedicel it is said to be sessile.

Pedom'eter, an instrument used for measuring walking distances by marking the number of steps taken. It is also so constructed as to mark the revolutions of a carriage wheel when attached to it.

Pe'dro, Dom, I., born near Lisbon in 1798, and died there in 1834, was the first emperor of Brazil and the second son of John VI. of Portugal. In 1807, he fled to Brazil with his parents on Napoleon's invasion of Portugal, and became prince regent of Brazil on his father's return to Portugal. For the proclamation of Brazilian independence and subsequent history, see BRAZIL.

Pe'dro, Dom, II., son of the foregoing, was born at Rio de Janeiro, Dec. 2, 1825, became king on his father's abdication in 1831, and was declared of age in 1840. During his long reign he was distinguished by his love of learning and scholarly tastes, and manifested no small degree of devotion to the welfare and prosperity of his people; but in the revolution of 1889, when Brazil was declared a republic, he was forced to abdicate his crown and withdraw to Europe. He died at Paris in 1891.

Pe'dro the Cruel, king of Castile and Leon, was born at Burgos, in Spain, Aug. 30, 1333. He was the only legitimate son of Alfonso XI., whom he succeeded in the year 1350. Three years after his accession to the throne, he married Blanche de Bourbon, sister of the French king, but soon deserted her for his mistress, Doña Maria of Portugal whose relatives he raised to the highest offices in his kingdom. Among many other victims of his cruelty, were two of his natural brothers, whom he put to death. At length, an insurrection was raised against him, under the leadership of his natural brother Henry. This he suppressed in spite of the excommunication of the pope, and the remainder of his reign was devoted to establishing his power and authority over his enemies, and to long and bloody wars with Aragon and Granada. In the year 1366, Henry, who had fled to France, returned at the head of a body of exiles, and revived his claims to the throne. Henry was supported by the pope, and also by Aragon and France; but Pedro, by promises of money and territory, secured the assistance of Edward the Black Prince, and totally defeated Henry at Navarrete, April 13, 1367. But Pedro so disgusted Edward by his cruelty to the vanquished, that the latter returned to France with his army, refusing any further alliance with a prince of such a character. In the autumn, Henry returned with an additional force, the people flocking to his standard. Pedro's army was completely routed at Montiel, March 13, 1369, and he himself taken prisoner. He was carried to a tent, where a single combat took place between him and Henry, in which Pedro was slain.

Pedun'cle, the general stalk of a flower cluster.

Peeks'kill, N. Y., a pretty and historic borough in Westchester county, on the Hudson river, and on the New York Central and Hudson River railroad, 43 miles north of New York city. It has a number of manufactories, stove-works, foundries, machine shops, shirt and cigar factories, flour mills, and blank-book and bookbinding establishments. The town has many fine churches, schools, a public library, military academy, convent, and an Episcopal school for young ladies, etc. Population 10,358.

Peel, Sir **Robert,** an eminent English statesman, was born near Bury, in Lancashire, Feb. 5, 1788. He entered the house of commons in 1809 as a Tory, and immediately began to show the diligence and prudence that were marked features of his character. He held the office of secretary for Ireland from 1812 to 1818, and in this position displayed such an unfriendly spirit toward the Catholics that they gave him the nickname of "Orange Peel," which clung to him through life. From 1818 to 1822, Peel was out of office; but in the latter year he reentered the ministry as home secretary; though in 1827 he retired. As home secretary, he distinguished himself by a reorganization of the London police force and by several other important measures. In 1829, Peel, as a member of the Wellington cabinet, proposed the bill for Catholic emancipation, and thereby separated himself from the Tory leaders with whom he had previously acted. The next year (1830) the Wellington-Peel ministry was succeeded by a Whig ministry under Earl Grey, and in 1832 the reform bill was passed in spite of Peel's vigorous opposition.

The general election of 1841 resulting in a decided victory for protection, Peel became prime minister with a large majority in both houses; but such was the demand for "cheap corn," that Peel was forced to yield to it and consented to the repeal of the corn laws. Peel retired from office in June, 1846, and, as a member of parliament for Tamworth, generally acted with the Whigs, whose free-trade principles he had fully accepted. He died at London in consequence of a fall from his horse, July 2, 1850. Peel declined a peerage and the order of the garter, and was universally respected for his ability as well as for his patriotism and high moral principle. See Guizot's *Robert Peel, Peel,* by J. R.

Thursfield, in the "Twelve English Statesmen" series, and Morley's *Life of Cobden*.

Pegasus (*peg'a-sus*), in Grecian mythology, the winged horse which sprang from the Gorgon Medusa when she was slain by Perseus. He is said to have received his name because he first made his appearance beside the springs (pegai) of Oceanus. When Bellerophon sought to catch Pegasus for his combat with the Chimæra, he was advised to sleep in the temple of Minerva, and during his sleep the goddess appeared to him and gave him a golden bridle, with which he caught Pegasus, and by her aid overcame the Chimæra.

Peking' or **Pekin'**, the northern capital of the Chinese empire, is situated on a sandy plain 100 miles from the sea (gulf of Pe-chili), and 60 miles from the great Chinese wall. The city consists of two parts—the northern, or Tartar city, and the southern, or Chinese city. The northern city is surrounded by a wall 60 feet high and from 40 to 50 wide, and the southern city by a wall 30 feet high and from 15 to 25 feet wide. The wall and moat are a little over 20 miles in length. Not counting the cross wall, the entire circuit measures about 21 miles, inclosing an area of about 25 square miles. In all, Peking has sixteen gates, over each of which is raised a tower 100 feet high, and of imposing appearance. Within the northern city is the Tsze-kin-ch'ing, or prohibited city, with a circumference of two miles, where the emperor has his residence. Peking has now railway communication with Tien-tsin, and with the gulf of Pe-chili at or near Taku.

Peking is one of the most ancient cities of the world. On the same site stood the metropolis of the feudal state of Yen, whose history can be traced back to the 12th century B. C. When Kublai Khan became emperor of all China, in 1280 A. D., he made Peking his capital, where he was found by Marco Polo. In the language of Dr. Williams "Peking stands to-day like the capitals of the ancient Roman and Byzantine empires, upon the debris of centuries of buildings." But little was known of the city, however, until the year 1860, when the English and French armies appeared before its walls and compelled the emperor to conclude the treaty of Tien-tsin or have his capital destroyed. Since that time the Chinese government has permitted ambassadors of other nations to have a residence in Peking, although they are not allowed to enter Tsze-kin-ch'ing, the Forbidden City. For an account of the attack on and siege of the foreign legations at Peking, in the summer of 1900, and the investment of the city by the armies of the foreign powers, see article on the Boxer Rising. The population of Peking is variously estimated at from 1,300,000 to 1,500,000. See Williamson's *Journeys in North China*, and Williams' *The Middle Kingdom*; also Martin's *The Siege in Peking*.

Pelagius (*pē-lā'ji-us*), the founder of the religious system known as Pelagianism, was born about the middle of the 4th century in Britain, or, as some suppose, in Brittany. He went to Rome about the year 400, where he showed considerable zeal and activity in seeking to reform the clergy and laity. Jerome and Orosius tell tales to his discredit, but Augustine always speaks of his character and conduct with respect. With his disciple, Cœlestius, he went to Carthage in 411, where Cœlestius was accused of heresy before a synod held in that city and condemned for the following doctrines: 1. Adam was created mortal, and would have died, even if he had never sinned. 2. Adam's sin affected only himself, and not his posterity. 3. Infants are born in the same condition as Adam was before he sinned. 4. The human race does not die in consequence of Adam's sin, and does not rise from the dead on account of Christ's resurrection. 5. Infants are saved whether baptized or not. 6. Men may be saved by obedience to the law as well as by the gospel. 7. There were men who lived without sin even before the appearance of Christ upon the earth. Meantime, Pelagius had gone from Carthage to Jerusalem, and in 415 he too was accused of heresy before the synod of that place. The matter was referred to Pope Innocent, but at another synod of 15 bishops, held the same year at Diospolis, Pelagius was acquitted. But a new synod of Carthage, in 416, condemned both Pelagius and Cœlestius, and its sentence was approved by Pope Innocent. Zosimus, the successor of Innocent, was induced to declare the two accused persons sound in the faith; but a council of 214 bishops was held at Carthage, in which the doctrines of Pelagius were formally condemned in nine canons, and Augustine appealed to the emperor, Honorius, who ordered the new heresy to be suppressed. Zosimus also published a decree approving the canons of the council held at Carthage, and requiring all bishops to sign them on pain of losing their office. Nineteen Italian bishops, under the leadership of Julian, bishop of Eclanum, refused to do so and were deposed. Pelagius himself was banished from Rome by the emperor, Honorius, and he and Cœlestius were again condemned by the council of Ephesus. The date and place of the death of Pelagius are not known.

Pelas'gians, a term applied to the most ancient inhabitants of Greece, Italy, and some portions of Asia Minor. In Homer, the Pelasgi seem to have been an unimportant tribe living in Thessaly. Herodotus seems to regard them as a race of barbarians who had occupied Hellas prior to the Hellenes. Thucydides, on the other hand, says that they were the most numerous of the various races that inhabit Greece. Amid such conflicting

testimony it is impossible to form any definite conclusions in reference to the Pelasgians; but we are at least justified in regarding them as an active and stirring people, chiefly intent upon agricultural pursuits. Yet they were no less brave and determined when attacked and driven to self-defense.

Pelew' Islands, a group of about twenty-five islands (now under the protection of Germany), lying southeast of the Philippine islands in the Pacific ocean, at the western extremity of the Caroline archipelago. These islands are mountainous, wooded, and are surrounded with coral reefs. Total area, 170 square miles. The inhabitants, about 10,000 in number, belong to the Malay race. The soil is fertile, and the climate healthy. The Pelew islands were discovered by the Spaniards in 1543, and sold to Germany in 1899.

Pel'ican, a water bird with webbed feet, and a long bill having a pouch on the under surface. The upper part of the bill hooks over the lower. Pelicans are large birds with powerful wings. They occur in both the Old and New Worlds, being mostly confined to the tropics and warm parts of the temperate region. North America has a single species — the white pelican. In warm summers, it breeds as far north as Nevada. They live upon fish, and at times, the pouch on the lower jaw is greatly distended with fish stored up to be eaten at leisure. The gannet and cormorant are related birds.

PELICAN.

Pelissier (*pā'lē'sē-ā*), **Aimable Jean Jacques,** a marshal of France, was born at Maromme near Rouen, Nov. 6, 1794. He entered the French army at the age of twenty; and after 36 years' service attained the rank of general in 1850. In the Crimean war, in 1855, he was placed in command of the first corps, and soon succeeded Marshal Canrobert in the chief command before Sebastopol. On the 8th of September he stormed the Malakoff, for which he was rewarded with a marshal's baton, and after the fall of Sebastopol he was also created Duc de Malakoff, and rewarded with a grant of $20,000. He died at Algers, May 22, 1864.

Peloponnesus (*pel-ō-pon-nē'sus*), a peninsula, now called the Morea, which formed the southern part of ancient Greece, so called by the Greeks, because King Pelops is said to have settled a colony there. It is about 140 miles long and nearly the same distance in extreme breadth. It is connected with northern Greece by the Isthmus of Corinth, which separates the gulf of Corinth from the Saronic gulf. The surface of the Peloponnesus is quite mountainous, the mean height of its mountains being about 1,000 feet. In the center a lofty circular ridge incloses an elevated basin, the famous vale of Arcadia. Among its ancient cities were Sparta, Argos, Mycenæ, and Mantinea. After the Messenian war, Sparta acquired supremacy over the other states, and three centuries later (431–404 B.C.) occurred the two Peloponnesian wars, which were mainly a contest for supremacy between Athens and Sparta, although many other states were involved in the conflict. In modern Greece, the term Peloponnesus is applied to a group of monarchies or provinces, which embrace among others Argolis and Corinth, Achaia and Elis, Arcadia, etc. Its area is about 8,000 square miles, with a population of nearly 860,000.

Pe'lops, in Grecian mythology, the grandson of Zeus and the son of Tantalus. His father invited the gods to a banquet, and, in order to test their superior knowledge, killed Pelops and served his remains at the table. They were not deceived and refused to touch the horrible food set before them; but Dementer, absorbed with grief for the loss of her daughter, ate part of a shoulder without knowing what kind of flesh it was. The gods then ordered the remains to be thrown into a cauldron, out of which Clotho brought the boy alive, an ivory shoulder being given to him in place of the one that had been eaten. Hence his descendants, the Pelopidæ, are said to have one shoulder white.

Pel'tier, Jean Charles Athanase, a French physicist, was born at Ham (Somme) in February, 1785; and died at Paris, in Oct., 1845. His father educated him for the watchmaker's trade and sent him to Paris. In 1815, he came into a fortune, which was moderate, but which enabled him to retire from business and devote himself to science. For some years he studied anatomy and microscopic animalcules; then turned his whole attention to electricity. In 1834, he made his great discovery, namely, that the junctions in a circuit of metals are heated or cooled according to the direction in which an electric current is made to flow through the circuit. If a current from an outside source is passed through a circuit of two metals, it cools one junction and heats the other. Seebeck, in 1822, had already discovered the converse of the "Peltier effect," namely, that if a circuit of two metals have its junctions maintained at different temperatures, an electric current is produced in the circuit.

Pem'mican, a kind of condensed food made by cutting lean meat into thin strips, and after thoroughly drying them, reducing them to powder and mixing the substance with boiling fat. It is much used by Arctic voyagers.

Pen (from the Latin *penna*, "a feather"), an instrument for writing with fluid ink. When the ancients wrote upon papyrus or parchment they used a reed pen, and when they used tablets of wood or stone they wrote upon them with a pointed stylus of bone or other material. Reed pens are still used by the natives of Persia and some other countries, as a metal pen does not suit their mode of writing. The Chinese and Japanese write with a small brush or hair pencil. When paper was introduced into Europe for writing purposes quill pens came into general use, and so continued down to the beginning of the 19th century.

The first English patent for the manufacture of steel pens was issued to Bryan Donkin in 1803; but the credit of bringing them into general use should be divided among four men—James Perry, John Mitchell, Joseph Gillott, and Sir Josiah Mason. Perry began pen-making at Manchester in 1819, using the best Sheffield steel for the purpose. He removed to London and had developed the pen trade to tolerably large proportions before the Birmingham manufacturers caused a revolution in the trade by the invention of machinery in the manufacture of pens, thus enabling them to be sold cheaply and to become articles of common use. The growth of the pen trade may be seen from the fact that in the year 1886 the weekly average of pens manufactured in Birmingham was over 2,000,000. The manufacture of gold pens has progressed to a much greater extent in the United States than in any other country, the annual product amounting to nearly $2,000,000 in value. The gold pen goes through no less than forty-five processes, from the gold bar purchased from the United States assay office to the highest finished article of commerce. To give hardness to the point of the pen it is tipped with iridium. The United States imports half a million gross of steel pens annually and manufactures nearly two million gross at Camden, Meriden, and Philadelphia, the steel used being chiefly imported from Birmingham. In the stylograph or fountain pen the nib is dispensed with, a finely tapered point connecting with the barrel containing the ink. The first fountain pen was brought out in the year 1848.

Penang', an island in the strait of Malacca, lying off the Malay peninsula, between it and Sumatra, belonging to Great Britain. With Singapore, Wellesley, and Malacca, it forms a crown colony, known as the Straits Settlements. It comprises an area of 107 square miles and contains 235,618 inhabitants. The coast of the island is very irregular, being indented by several bays. The surface is intersected by a mountain range, the highest point of which is about half a mile above the level of the sea. The soil is very fertile, and rice, tapioco, pepper, cloves, nutmegs, and other tropical fruits and vegetables are grown. Georgetown, in the northern part of the island, is the capital. It has a good harbor and considerable trade. The native states of the Malay peninsula, adjoining, are under British protection, and contain the richest tin fields in the world, besides valuable forests yielding rubber, gutta-percha, and gums.

Pen'cil. A slender stick of black lead, slate, or chalk, inclosed in a round piece of wood, is called a pencil, but the term is also applied to small hair brushes, used by artists, and it is to these that the name was originally given. For a long time the graphite or plumbago from the Cumberland mines, in England, furnished the "leads" for the best pencils ever made; and since these mines were exhausted, vast quantities of the same material have been found in Siberia. By a method, patented by Mr. W. Brockedon in 1843, this material is freed from impurities by first grinding it to powder, and then formed in solid blocks by subjecting it to heavy pressure in cases from which the air is removed. The manufacture of black lead and colored pencils is carried on extensively at Nuremberg, where there are more than twenty factories, which employ several thousand hands and produce annually about 250,000,000 pencils.

Pen'dulum, literally a hanging body, is used in physics to denote any body performing isochronous, or nearly isochronous, vibrations. Thus a magnet freely suspended so as to vibrate in a horizontal plane is sometimes called a *magnetic* pendulum. An ordinary clock pendulum is called a *gravitational* pendulum. A brass rod, suspended by a wire so as to vibrate in a horizontal plane, is generally known as a *torsion* pendulum. Space permits us here to discuss only the gravitational pendulum. This simple but elegant instrument serves two principal purposes, each of which was first pointed out by the great Dutch physicist, Huygens (1673). One of these uses is that of a time-measurer, an application based on the fact that, so long as a pendulum remains of constant length and swings through the same angle, it vibrates at a constant rate. In practice its length is kept constant by "compensation" and its angle of swing is kept constant by means of a spring which gives it a little push at each vibration. (See CLOCK.) The second use of the pendulum is as an instrument for measuring the acceleration of gravity at various points over the surface of the earth. This is generally done in one of two ways, namely, either by suspending a heavy metallic sphere of known radius by means of a fine wire of known length, and observing the period of vibration; or by suspending a bar of metal from one of two points such that it has the same period of vibration from whichever point it be suspended. The former method is a near approximation of what is called a *simple* pendulum, namely, a heavy particle suspended by a massless thread; the latter is a *revers-*

ible compound pendulum. It can be proved, by dynamics, that the period, T, of a simple pendulum whose length is l, is given by the equation

$$T = \pi \sqrt{l/g}$$

where g is the acceleration of gravity at the place of observation. Using this equation for the brass ball, suspended by a wire, and making some slight corrections for the wire and for the diameter of the ball, one may obtain a very accurate value of the acceleration of gravity. This method is due to Borda. In the case of the reversible pendulum it can be shown that the distance between the two points of suspension is exactly equal to the length of a simple pendulum which would vibrate with the same period. Hence, to obtain g with great accuracy, one has only to measure this distance, which we may call l, determine the period, T, and solve for g the equation given above.

The pendulum is frequently employed also to compare the acceleration of gravity at several different places. Here we may disregard the length of the pendulum, *provided this remains constant*, since the ratio of the acceleration at two stations depends only upon the square of the ratio of the periods at the same two stations. For this purpose the United States Coast Survey uses pendulums which are very short and convenient, beating quarter-seconds.

Penguin (*pĕn'gwĭn*), a swimming bird peculiar to the southern hemisphere. Their wings are paddle-shaped, and while they do not suffice for flying, they are used in swimming and brought into use alternately. In diving and swimming under water, the wings only are used, the feet being used as a rudder. The feet are placed so far back on the body that the bird is erect when standing. They have a smooth scale-like plumage adapted for slipping through the water. These birds live mostly on the water and go on shore only to breed. During the breeding season, they are found in great numbers on rocky islands far from habitations, as on the Falklands, the Kerguelen islands, and rocky parts of New Zealand. There are three kinds, the king penguins, the jackass penguins, and the rock-hoppers. The king penguin stands about three feet high, and some other species are about one-half that size.

KING PENGUIN.

Penin'sular War. The quarrels between Charles IV., king of Spain, and his son, Ferdinand, in 1807, gave Napoleon an opportunity of interfering in the affairs of that country. In pursuance of a treaty made with Charles he had sent an army into Portugal under Junot, by whom Lisbon was seized, and the members of the royal house obliged to flee to Brazil. For the pretended purpose of supporting Junot's army other French troops occupied Valladolid, Salamanca, and other important positions in Spain, including Madrid, where Murat was in command. Riots at Madrid, Toledo, and other places caused the feeble king such alarm that he surrendered his crown to Napoleon, who at once bestowed it upon his brother Joseph, then king of Naples. Joseph Bonaparte was accordingly proclaimed king of Spain in Madrid, July 24, 1808. But the Spanish provinces refused to recognize Joseph, and rose against the French in all directions. Assistance was supplied to the patriots of Spain and Portugal by Great Britain; and on the 12th of July, 1808, Sir Arthur Wellesley (afterward duke of Wellington) was sent to Portugal with 30,000 men. Wellesley defeated Laborde at Rolica and Junot at Vimiera, but then turned over the command to Sir Harry Burrard, who had been sent out to supersede him, to be himself superseded within a few hours by Sir H. Dalrymple. The latter officer concluded the convention of Cintra with the French, who evacuated Portugal during September, 1808. But Napoleon continued to send large re-enforcements to Spain, and came to Madrid to direct the operations of his forces; and when Sir Arthur Wellesley was again sent out, in the spring of 1809, he found himself confronted by nearly 400,000 French troops, in eight corps d'armée, commanded by six marshals and by Generals Junot and St. Cyr. Wellesley at once proceeded to active operations; but it took a conflict of five years and many hard-fought battles to drive the French forces out of Spain. For his services in this war, Wellesley was created duke of Wellington, and received a grant of $2,500,000 from the English parliament.

Penn, William, founder of the colony of Pennsylvania, was the son of Admiral William Penn, and was born at London, Oct. 14, 1644. Penn studied at Christ Church, Oxford, and while there became a convert to Quakerism by the preaching of a disciple of George Fox, named Thomas Loe. In 1668, Penn was thrown into the Tower on account of a publication entitled *The Sandy Foundations Shaken*, in which he attacked the doctrines of the trinity, God's "satisfaction" in the death of Christ, and justification by the imputation of Christ's righteousness. While in prison he wrote the two most famous and popular of his books, *No Cross, No Crown*, and *Innocency with Her Open Face*, a vindication of himself, which contributed to his

liberation through the influence of the Duke of York. In September, 1670, Admiral Penn died, leaving his son an estate of $7,500 a year and certain claims upon the government for $80,000. In 1672, Penn married Gulielma Maria Springett, daughter of Sir William Springett, and for some years thereafter continued to advocate the doctrines of Quakerism by preaching and writing.

In 1681, in lieu of his monetary claim upon the government, he obtained a grant of territory comprising the present state of Pennsylvania. He desired to call it Sylvania, but King Charles II. insisted on the prefix Penn, in honor of his father. Penn sailed for the New World in September, 1682, and in October held his famous interview with the Indian tribes under a large elm tree, on the ground where Philadelphia now stands. In this interview, Penn concluded a peaceful arrangement with the Indians for the purchase of their lands, and for fifty years afterward his colony was unmolested by them. Penn planned and named the city of Philadelphia, and for two years managed the affairs of his colony in the wisest, most benevolent, and liberal manner. Not only Quakers, but persecuted members of other religious sects, sought refuge in his new colony, where the principle of religious toleration was fully recognized and respected.

Toward the end of the reign of Charles II., Penn returned to England to exert his influence in favor of his persecuted brethren at home, in which he was so far successful that soon after James II. came to the throne, in 1685, 1,200 imprisoned Quakers were set at liberty. After the accession of the Prince of Orange, Penn was accused of treason and conspiracy, but was acquitted. In 1699, Penn paid a second visit to the New World, where his colony required his presence, on account of the arbitrary behavior of his deputy. His stay, which lasted two years, was marked by many useful measures and by efforts to improve the condition, not only of the colonists, but of the Indians and negroes also. He returned to England in 1701, on account of the condition of his finances in that country, which had been left in charge of an agent named Ford. When Ford died, he left claims against Penn which the latter refused to pay, and was committed to the Fleet prison, where he remained until his friends procured his release by settling the claims against him. In 1712, he was stricken with paralysis, from which he never recovered, although his death did not take place in Berks, England, until July 30, 1718.

Pen'nel, Joseph, an American artist and engraver, was born at Philadelphia in 1860. He married Elizabeth Robbins, and he and his wife have been almost continuously traveling, writing and sketching since 1885. In this time they have visited many of the cities and sailed down most of the historic rivers of the Old World. Mr. Pennel's works are very numerous, all illustrated in that pen-and-ink style for which he is justly famous. His first book was *A Canterbury Pilgrimage* (1885); the last, *The Work of Charles Keene* (1897). Mr. Pennel and his wife at present (1901) reside in London.

Pennsylvan'ia, one of the original thirteen states, and since 1830 the second state of the Union in population, is a parallelogram in shape, being about 300 miles in length and a little more than half that distance in width. It is bounded on the north by Lake Erie and the state of New York; on the east by New Jersey, from which it is separated by the Delaware river; on the south by Delaware, Maryland, and West Virginia; and on the west by West Virginia and Ohio. Pennsylvania is naturally divided into three unequal portions, the first being the southeastern part of the state, which extends from the Delaware river to the Blue mountains. This region comprises the Cumberland valley, extending without a barrier to the sea and famous for its fertile soil and vast mineral resources. The Appalachian system of mountains, which crosses the state from northeast to southwest in a belt from 75 to 150 miles wide, may be classed as the second division. This system of mountains, besides the Blue or Kittatinny range on the east and the Alleghenies on the west, contains a number of minor chains or ridges. These minor ranges are interspersed with many broad and fertile valleys, and the rivers have, in some places, cut gaps through the ridges, affording passages for travel and commerce. The third division of the state is the western plateau, comprising about half its area, and extending from the western slopes of the Alleghenies toward the Ohio river, New York, and Lake Erie. This region is crossed by a few ridges and has several isolated peaks, such as Towanda mountain, Blossburg mountain, and Crooked Creek mountain. It contains a large number of pine and hemlock forests, and furnishes a vast amount of lumber to eastern markets.

Western Pennsylvania is noted for the vast quantities of bituminous coal and of iron ore that is mined within its limits, the city of Pittsburg being the chief center of the iron industry. The beds of anthracite coal between the Delaware and Susquehanna rivers are practically inexhaustible, it being estimated that even the present vast output of 25,000,000 or 30,000,000 tons a year would not exhaust the supply for several centuries. The anthracite coal region covers an area of about 500 square miles, the most important deposits lying in what are known as the southern, middle, and northern fields. In 1899, the state output of rolled iron and steel was in volume over seven million tons, of which Allegheny county furnished more than half. In the same year, the anthracite coal output exceeded sixty million tons, while the output of bituminous coal was close upon

seventy-five million tons. Several million barrels of petroleum are produced in the state every year.

Educationally, Pennsylvania ranks high among the states of the Union. In 1899, the state had nearly 15,000 public school buildings, with 29,000 teachers and a pupil enrolment of 1,186,146. There were also in the state 300 high schools, besides a large number of professional colleges and schools. At Philadelphia is the University of Pennsylvania, and at Allegheny the Western University of Pennsylvania. In other sections of the state there are over 30 universities and colleges belonging to the different denominations.

Pennsylvania is second only to New York in the product of her manufactures, while the annual product of her mines is nearly equal in value to that of all the other states of the Union. Eastern Pennsylvania is drained by the Delaware and the Susquehanna rivers and their tributaries, and western Pennsylvania by the Allegheny and the Monongahela, which unite their waters at Pittsburg, and form the Ohio. There are nearly 10,400 miles of railroad in the state, the greater portion of which is owned and controlled by the Pennsylvania and the Pennsylvania and Reading companies. The area of Pennsylvania is about 45,215 square miles. Population 6,302,115.

Peh'ny, an English coin, one-twelfth of a shilling in value, first mentioned in the laws of Ina, king of the West Saxons, about the close of the 7th century. It was at this time a silver coin, and weighed 22½ grains, being about $\frac{1}{240}$ of the Saxon pound weight. Halfpence and farthings were not coined in England till the time of Edward I., but the penny was indented with a cross-mark, so that it could easily be broken into either two or four parts. The penny steadily declined in weight until the reign of Elizabeth, when it was fixed at $7\frac{7}{11}$ grains, or $\frac{1}{62}$ of an ounce of silver, a value to which the copper pennies, first introduced in 1797, closely approximated. The present penny is made of bronze, and is of only half the value of the copper penny, for which it has been substituted.

Penob'scot, the largest river in Maine. The west branch rises near the Canada line, and flows east and southeast to the town of Medway, where it meets the east branch, or Seboois river. Afterward its course is southwest to Penobscot bay, an inlet of the Atlantic ocean on the southern coast of the state. The Penobscot is navigable for large vessels to Bangor, 60 miles from its mouth. Its upper waters are used for floating logs from the forests of northern Maine to Bangor and other points, where they are sawed into lumber. The length of the Penobscot is 300 miles, and it is the most important navigable stream in the New England states.

Pensacola (*pen'sȧ-kō'lȧ*), a city and port of entry of Florida, the capital of Escambia county, 250 miles from New Orleans, on the west shore of a deep bay opening into the gulf of Mexico. Near by, is the Pensacola navy yard, with a marine hospital and barracks. Pensacola was settled by the Spaniards be-

fore 1700, occupied by the British from 1763 to 1781, and afterward, during the wars with Napoleon, taken from them by Andrew Jackson in 1814, and in 1819, with the remainder of Florida, became a part of the United States. Population 17,747.

Pen'sions, the regular allowances of money paid to individuals by a government in return for services, civil or military. Most European governments have both a civil and a military list; but in the United States military service alone constitutes a claim for pension. In general, pensions are granted only for active service in time of war and for injuries received during such service. "Service pensions" were granted to all survivors of the Revolutionary war by act of 1818, to all survivors of the War of 1812 by act of 1871, and to the survivors of the Mexican war by act of 1887. But the bulk of United States pensions are "invalid pensions" for wounds or disability incurred in service. These extend to the widows, and children under sixteen years, of those who died from such wounds or disease; or, in the event of there being no such surviving widow or children, then to dependent fathers or mothers or minor brothers and sisters of men so dying. The pensions, which range from $24 to $2,000 a year, are graded according to the rank of the pensioner and the degree of his disability. Thus, where the regular aid or attendance of others is required, from $50 to $72 a month is allowed; where the pensioner is incapacitated for manual labor, $30 a month; for the loss of a hand or foot or total deafness, $30 a month; for the loss of both feet or hands or both eyes, $72 a month, and for amputation at the shoulder or hip joint, $45 a month.

In addition to these provisions for injuries incurred in the service, by the law of June 27, 1890, all persons who served ninety days or more in the army or navy of the United States during the Civil war, and were honor-

ably discharged therefrom, and who are now suffering from any permanent disease or disability, not the result of their own vicious habits, which unfits them from earning their support by manual labor, are allowed a pension of from $6 to $12 a month, according to the degree of disability. By the same law, the widow of any such soldier, without other means of support than her daily labor, shall receive $8 a month during her widowhood, provided she married such soldier prior to June 27, 1890.

An independent bureau for the transaction of the pension business of the government was established in 1833, and in 1849 it was made a bureau of the department of the interior. The commissioner of pensions is appointed by the President, and under him there are about 2,000 persons employed in the examination and settlement of pension claims; and there is an equal number of surgeons throughout the country whose duty it is to examine all applicants ordered to appear before them.

The growth of the pension system of the United States government, and its liberality toward its soldiers and sailors, may be seen from the following figures: In 1862, the amount of money paid out for pensions was less than $1,000,000; in 1872, ten years later, it exceeded $30,000,000; in 1880, it was $57,240,540; for the year ending June 30, 1890, it was $109,357,534; for the year ending June 30, 1891, it was $116,972,172; for the year ending June 30, 1899, it was $142,502,570. The total number of pensioners on the roll at the latter date was 993,529. Owing to the casualties in the war with Spain, the secretary of the interior asks for a pension vote, for the year ending June 30, 1902, of $145,245,000.

Pen'tateuch (*tūk*) (from the Greek words *pente*, "five," and *teuchos*, "book"), the name given by the Christian fathers to the first five books of the Bible—Genesis, Exodus, Leviticus, Numbers, and Deuteronomy. The Jewish name given to these books was *Torah*, meaning "the law." In connection with the book of Joshua these five books really form one continuous work, called by many modern schools the *Hexateuch*.

Pe'onage, a system of servitude common in Mexico and some Spanish-American states. By the Spanish colonial system, the peon in debt to his employer was bound to labor for him until the debt was paid. It is claimed that under this system employers often contrived to keep their laborers in continual servitude by advancing them money for needless expenditures or selling them goods on credit and at high prices. Peonage in the territory of New Mexico was abolished by act of congress in 1867. It has also been abolished in the Argentine republic, and some other South American countries.

Peo'ria, Ill., a large and enterprising city on the Illinois river, 62 miles north of Springfield, and 160 miles southwest of Chicago. It is an important railway center, the union depot being used by ten of the railway lines that meet at this point, and is connected by seamboat navigation with the Mississippi. It contains a Roman Catholic cathedral, a high school, a medical college, and three hospitals. There are ten parks within the city's limits, the largest (Jefferson) containing 35 acres. Population 56,100.

Pep'in le Bref ("the short"), son of Charles Martel and father of Charlemagne, was born in 714. Charles Martel, before he died, divided his kingdom between his two sons, Carloman and Pepin, the former taking the German part, the latter Neustria and other portions of northern France; still they were only rulers in the name of the Merovingian king. St. Boniface, in 751, crowned Pepin king of the Franks, Childeric, the last king of the Merovingians, having been deposed; and when Pope Stephen III. was hard pressed by the Lombards under Aistulf, in 754, he came to France to solicit help from Pepin. The latter led his army into Italy, compelled Aistulf to become his vassal, gave to the pope the title of exarch of Ravenna, thus first establishing the temporal sovereignty of the holy see. He died in 768, and his two sons, Carloman and Charlemagne, divided his territories between them.

Pep'per, William, an American physician, educator, author, and benefactor, was born at Philadelphia, Aug. 21, 1843, and educated at the University of Pennsylvania, from which he took both his classical and his medical diplomas. Within four years after receiving his degree as a physician, he was appointed lecturer in the same college, and he was connected with the university up to the time of his death. He was elected provost of the university in 1881; and during his incumbency of thirteen years it became a new institution, one of the foremost in the states. So great was his devotion to the university, that he not only gave his services free, but contributed many thousands of dollars out of his own private fortune toward its various endowments. His health suffered from too constant application, and in 1894 he retired, removing to California, where he died July 28, 1898.

Pep'sin, a substance contained in the gastric juice and the mucous membrane of the stomach, to which the gastric juice largely owes its power of dissolving the contents of the stomach, and converting them into chyme. Various plans have been devised for extracting pepsin from the stomachs of calves, pigs, and other animals; but it has never yet been obtained in its purity, and its chemical constitution is unknown. Pepsin has been used to a considerable extent in medical practice, in cases of weak or disordered digestion; and it is an ingredient in most of the digestive preparations now in the market.

Pepys (*pēp'is*) **Samuel**, a notable English diarist, born in 1633, and died in 1703. His famous *Diary* deals with the era of the Restoration, and is replete with minute and curious facts concerning the times in which its author lived. The *Diary* was written in cipher, and was not discovered and published until 1825.

Pequots (*pē'kwŏts*) or **Pe'quods**, a tribe of North American Indians, a branch of the Mohicans, who inhabited the country around the Thames river when Connecticut was first settled by the English. It is supposed they branched off from the Hudson river Mohicans at the beginning of the 17th century. They soon conquered most of the tribes in Connecticut, and made treaties with the Dutch and English. But afterward, becoming hostile, an expedition was sent against them from Hartford in 1637. A Pequot fort, near the present town of Groton, was attacked and fired, and in the struggle amid the burning wigwams, several hundred men, women, and children perished. The war continued until the tribe was nearly annihilated at Fairfield swamp. The remnant was either sold as slaves or scattered among the neighboring tribes, but a small number were afterward gathered into bands in Ledyard and North Stonington; and at this day there are a few descendants of the Pequods living at Green Bay, Wis.

Perch, a fresh-water fish generally distributed in Europe, the eastern United States, and northern Asia. There are about one hundred species in the perch family. The common yellow perch of Europe and the eastern United States, is the type of those of moderate size. The American form is dark olive-green above, with golden-yellow sides crossed by six or eight dark bars; the lower fins are orange and the upper ones dark green. A few larger fishes, called pike-perches,

PERCH.

also belong to the family. The wall-eyed pike is a perch, not a pike. It is one of the most important food fishes of the lake region, and is abundant in Saginaw bay. It attains a length of three feet, and a weight of ten to thirty pounds. In contrast with these large fish, the perch family includes a number of darters too small to be of use as food.

Per'cival, James G., an American poet and geologist, was born at Kensington, Conn., Sept. 15, 1795, graduated at Yale college in 1815, and afterward entered the medical profession. Having removed to Charleston, S. C., in the year 1822, he there published his two poems, *Prometheus* and *Clio*. Two years later, he was appointed professor of chemistry at West Point, but finding the duties of this position too heavy and irksome, he soon resigned and was made surgeon in connection with the recruiting service in Boston. In 1827, he moved to New Haven, where the third part of *Clio* was published. Percival afterward divided his attention between poetry and geology, and as he grew older he gave more and more time to the latter. In 1835, he and Professor Shepard were appointed to make a geological survey of Connecticut, his report of which was published in 1842. He was appointed geologist of Wisconsin in 1854, and died at Hazel Green in that state, May 2, 1856.

Percy, the name of a distinguished English family, descended from William de Percy, who accompanied William the Conqueror to England in 1066, and received large grants of land from that sovereign.

Peren'nial Plants, those which live from year to year, either by the persistence of their stems, as in the case of shrubs and trees, or by the persistence of underground parts. The actual duration of such plants is exceedingly variable, the term simply meaning that they do not disappear entirely within one or two years. They may endure a few years or hundreds of years. See DURATION.

Perfectibil'ity or **Perfec'tionism** is the doctrine that man in a state of grace may attain to perfection and live without sin in this life. Catholics hold that no one, except by special privilege of God, as in the case of the Blessed Virgin, can live without sin altogether. Among Protestants, Wesleyan Methodists, and some other sects believe in the possibility of a Christian perfection attainable in this life. Most believers in the doctrine, however, define perfection not as that state which admits of no further growth, or progress, but rather as the beginning of growth in grace and the knowledge of the truth. Most Protestant sects, however, deny that man can attain perfection in this life, even by the assistance of divine grace.

Perfec'tionists, also called Communists and Free-Lovers, a small American sect founded by John Humphrey Noyes, who was born at Brattleboro, Vt., Sept. 6, 1811. Noyes practiced law a number of years and then became a Congregational preacher. Experiencing a second conversion, he claimed that the prevailing theology is all wrong, and separated himself from the Congregational church. He held that the gospel, if accepted, secured entire freedom from sin; that God has a dual being (male and female); that the author of evil is uncreated but is not God; and that communion with Christ not only

saves from sinning, but also from disease and death. He and his converts formed a Perfectionist church or community at Putney, Vt., afterward moving to Oneida, N. Y. Men and women put their property into a common stock; they gave up all formal prayer and religious service and the observance of the Sabbath; those who were married renounced their marriage ties, and a "complex marriage" was established between all the males and all the females of the "family." Having as far as possible dispensed with law, he set up public opinion as a controlling power in its place; and free criticism of one another by the members of his sect became a marked feature of his system. In 1880, the pressure of outside influence caused the community to change their mode of life in many respects. Marriage and the ordinary family relationship was introduced; communism of property gave place to a joint-stock company organization, and various co-operative institutions were also established. Noyes, who assisted in making these changes, died at Niagara Falls, April 13, 1886.

Perfum'ery or **Per'fumes,** the delicate smells arising from certain odoriferous bodies. Perfumes are of two distinct classes: those derived from plants and those of animal origin. Of vegetable perfumes, the most ancient are those gum-resins which exude naturally from the trees and plants, or from wounds inflicted to increase the yield. Among the most important gum-resins are myrrh, benzoin, and camphor. Gum-resins form the chief ingredients in incense and pastilles.

A second group of vegetable perfumes are those procured by *distillation*. These were formerly termed quintessences, but are now called ottos, from the Turkish word *attar*, applied to the attar or otto of the rose. The process of distillation is a simple one. The fragrant part of the plant is put into the still and covered with water; and when the water boils the ottos arise with the steam, from which they are separated by decanting. By this process, 100 pounds of orange or lemon peel will yield about ten ounces of the fragrant oil; 100 pounds of nutmeg will yield 60 to 70 ounces of oil of nutmeg; other substances in various proportions.

But as it has been found that many flowers do not yield their essential oil by distillation, two other processes have been devised for obtaining it, namely, *enfleurage* and *maceration*. In the former of these processes square boxes with glass bottoms are provided upon which is spread a mixture of lard and suet, which has been melted and clarified for the purpose. Fresh flowers are spread every morning upon this grease, the box being kept closed until the grease absorbs their odor. When the grease has been "enflowered" in this way, the process generally lasting three weeks or more, it is again melted and strained into canisters, and is then ready for use. Perfumes are also obtained from flowers by maceration, that is, by placing them in oil or melted fat for several hours, and by continuing the process with new flowers until the oil or fat becomes fragrant with their odor. The best-perfumed grease is obtained from some flowers by enfleurage, and from others by maceration, while others will produce the most satisfactory results by both processes — enfleurage followed by maceration.

Some extent of the flower industry may be obtained from the following figures showing the weight of certain flowers grown in the south of France in the year 1889: Orange blossoms, 1,860 tons; roses, 930 tons; violets, 147 tons; jasmine, 147 tons; tuberose, 74 tons. Europe and British India alone consume about 150,000 gallons of handkerchief perfumes yearly. The English revenue from French eau de cologne is $40,000 a year, and from other imported perfumes $200,000.

The principal perfumes of animal origin are musk, civet, ambergris, and castor, of which musk is most highly prized. The aroma of musk imparts odor to every body or thing with which it comes in contact. Its power to impart odor is so great, that polished steel will become fragrant with it, if they are both placed in a closed box for a sufficient length of time. In the manufacture of perfumery, tincture of musk is mixed with other odorous bodies to render the scent more permanent. See *Rose Industry of Bulgaria*, and Piesse's *Art of Perfumery*.

Pergamus (*per'ga-mus*) or **Per'gamum,** a city of Mysia, in Asia Minor, on the river Caicus, 15 miles from its mouth. According to tradition it was founded by Greeks from Arcadia, but its origin is unimportant. It first acquired prominence when Lysimachus, one of the generals of Alexander the Great, chose it as a stronghold in which to keep his treasures. Under the eunuch Philetærus it became the capital of a state in the year 283 B. C. Attalus III., who died 133 B. C., left it to the Romans, under whom it became one of the chief cities of Asia Minor. It began to decline under the Byzantine emperors, and at the present time, under the name of Bergama, it is noted only for the magnificence of its ruins, which embrace temples, palaces, aqueducts, amphitheatres, besides its city walls. Bergama, 50 miles north of Smyrna, occupies the site of ancient Pergamus. See BERGAMOT, OIL OF.

Peri (*pē'ri*), according to the mystical lore of the east, a being begotten by fallen spirits, which spends its life in all imaginable delights, but is forever excluded from the joys of paradise. It occupies an intermediate place between angels and demons, and is either male or female. Like the fairies in our own popular mythology, the female Peris possess surpassing grace and beauty.

Per'ianth, the general name of the floral leaves of a flower, including both calyx and

corolla. It is more especially used in case the calyx and corolla are similar in appearance, as in the lily.

Per'iblem (in plants). At the apex of the stem or root of the higher plants the great regions are first organized in an embryonic form. The embryonic region which organizes the cortex (which see) is the periblem, and it lies just within the "dermatogen," which is the embryonic epidermis.

Per'icarp (in plants), a name chiefly used in connection with the fruit of seed plants (Spermatophytes), and applied to the transformed ovary, which invests the seeds as a variously modified outer wall. A pea pod, exclusive of the peas, is the pericarp. In apples it is the parchment-like investment of the core; while in the peach the pericarp includes both the flesh and the stone, the "kernel" being the inclosed seed.

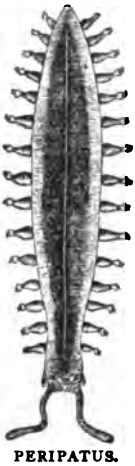
Pericles (*per'i-klēz*), the greatest statesman of ancient Greece, was born in the closing years of the 5th century B. C. He received a thorough and extensive education, but of all his teachers the one whom he always held in the highest regard was the humane philosopher, Anaxagoras. Pericles was noted throughout his public career for the quiet dignity of his manners, the grandeur of his eloquence, his sagacity, his honesty, and his profound patriotism. When he entered public life, although his family did not rank among the highest in wealth or influence, yet so great was his ability and so noble was his character that he soon rose to the highest power in the state as the leader of the popular party. Pericles seems to have grasped very clearly, and to have held very firmly, the modern idea that as the state is supported by the great body of citizens, its laws should be so framed and administered as to secure the greatest good to the greatest number, rather than to promote the interests of any special class or classes. About 463 B. C., Pericles struck a great blow at the Athenian oligarchy by the introduction of a system whereby the poorer classes could serve on juries and take a more active part in public life. Shortly after this, Cimon, the leader of the oligarchy, was banished from Athens by ostracism. By sheer force of his talents and character, Pericles now became the ruler of Athens. In the year 457 B. C., he magnanimously proposed the recall of Cimon, with the agreement between them, it is said, that Cimon should command the army of Athens on its expeditions abroad, and not oppose Pericles in the administration of affairs at home.

PERICLES.

Pericles earnestly sought to unite the various Grecian states in a grand confederation, in order to put an end to all their domestic difficulties and thereby make Greece a powerful nation, able to defend itself against all the powers by which it was surrounded. Had the idea of Pericles been carried out, Athens in later years might have proved herself more than a match for Philip and Alexander of Macedon, and might even have resisted the power of the Roman legions. But there was already that smothered feeling of hostility between Athens and Sparta that rendered the Peloponnesian war inevitable. Pericles warded off this conflict by diplomacy and bribery; but it came at last, in the year 431 B. C. The plague ravaged the city of Athens the next year, and in the year following (429 B. C.) Pericles died, after a lingering fever. It is well nigh impossible to relate all that Pericles did to make Athens the most glorious city in the ancient world. Under his patronage, Greek architecture and sculpture reached their highest development. To him Athens owed the Parthenon, the Odeum, and that most stupendous of all architectural constructions of Greece, the Propylæum. He also encouraged music and the drama; and during his rule industry and commerce were in so flourishing a condition that there was universal prosperity in Attica. Although he had many enemies who denounced him for the expenditure of so much public money upon buildings and amusements, the truthful pen of Thucydides records that he did not act unworthy of his high position, that he never oppressed or persecuted his adversaries, and that although he had unlimited command of the public purse, he was personally above corruption. Plutarch records that when Pericles lay dying and the friends around his bed were reviewing the grand achievements of his life, he quietly interrupted them by saying: "What you praise in my life belongs partly to good fortune, and is, at best, common to me with many others; but the thing of which I am proudest is that no Athenian has ever put on mourning on my account."

Perigynous (*pĕ-rĭj'ĭ-nŭs*) **Flowers,** those in which the sepals, petals, and stamens are borne on the rim of a cup-like body which rises around the pistil or pistils, as in certain members of the rose family. The noun form is perigyny, and the contrasting terms are "hypogyny," in which the other floral parts arise from beneath the ovary, and "epigyny," in which they seem to arise from the summit of the ovary.

Perip'atus, an interesting animal connecting worms and insects. There are about twenty species known, inhabiting South Africa, Australia, New Zealand, South America, and the West Indies. They have a long body like a worm or caterpillar, but the segments, or joints, do not show on the outside. Internally, however, they are well marked. There is no division into thorax and abdomen. The head bears antennæ and jaws. The body is provided with short, jointed feet (14 to 42 pairs), like a thousand-legged worm. Like the myriapods, they are found under stones and in rotting wood, and feed on insects and the like. Their internal structure is noteworthy. They possess a pair of looped tubes in each segment of the body, like those of worms, and, in addition, they have breathing tubes like those of insects and myriapods. There are structural peculiarities of two different sub-kingdoms of animals united in peripatus. It is a sort of generalized form bridging the gap between worms and myriapods, and the myriapods connect with the lowest insects. Peripatus is of much interest to zoologists as a survivor of a very ancient family of animals, and as a link between the worms and arthropods.


PERIPATUS.

Per'isperm, the nutritive tissue which occurs in seeds outside of the embryo-sac. Within the embryo-sac the nutritive tissue is called "endosperm." Perisperm is derived from the nucellus of the ovule, while endosperm is a part of the female gametophyte. In most seeds perisperm does not exist, all the nutritive tissue being endosperm.

Per'istome (in plants), the set of tooth-like processes found at the open mouth of the capsules of mosses. They arise from the rim and extend radially toward the center, and are of various and often beautiful patterns. See MUSCI.

Perpet'ual Motion, stated in modern terms, is a name given to the problem of creating energy. Lavoisier proved the impossibility of creating or annihilating even the most minute portion of *matter*. In like manner, all modern physical investigations have shown the impossibility of creating or annihilating *energy*. And since no mechanism is known which does not absorb some energy in friction, it is evident that if we are to keep any mechanism in motion we must constantly supply it with energy.

This great generalization may be said to date from the year 1847, when Helmholtz published his great memoir on the *Conservation of Energy*. But long before that time, it was well known to clear thinkers that the law of the conservation of energy applied to all purely mechanical operations. Accordingly, in 1775, the French academy declared that it would not thereafter receive any communications upon the subject of perpetual motion. This latter date may, therefore, be considered as marking the complete overthrow of the idea that motion can be secured in any actual mechanical device without a constant supply of energy. And the year 1847 may be considered as marking the overthrow of the idea that perpetual motion can be secured by any means whatever, whether mechanical, electrical, thermal, or otherwise. See articles on ENERGY, and DYNAMICS.

Per'rault (*pā-rō'*), **Charles,** a French author, was born at Paris, Jan. 12, 1628, the youngest of an advocate's four sons. He was sent at nine years of age to the Collège de Beauvais, but quarreled with his teachers, and the rest of his education was left to himself. He studied law and was admitted to practice, but soon tiring of the routine of the legal profession he procured an easy post under his brother, the receiver-general of Paris. Perrault's name has been made immortal by eighteen fairy tales, published in 1697. The titles of these stories are, *The Sleeping Beauty*, *Little Red Riding Hood*, *Bluebeard*, *Puss in Boots*, *The Fairy*, *Cinderella*, *Hop o' My Thumb*, etc. Perrault died at Paris, May 16, 1703.

Per'ry, Oliver Hazard, an American naval officer, was born at South Kingston, R. I., Aug. 23, 1785. He entered the United States navy in 1809, and at the beginning of the War of 1812 was transferred at his own request from the command of a division of gunboats on the Atlantic coast, to serve under Commodore Chauncey on lakes Erie and Ontario. He participated in the attack upon Fort George at the head of a body of seamen, but his fame rests upon the victory he won over the British squadron on Lake Erie, near Put-in-Bay, O., Sept. 10, 1813. In this action, known as "Perry's victory," the Americans were completely victorious, the result being fitly told in Perry's dispatch to the government: "We have met the enemy, and they are ours." He was rewarded with the rank of captain and a vote of thanks by congress. He continued in the naval service of the government throughout this war and for several years thereafter, until his death, which took place at

COMMODORE O. H. PERRY.

Port Spain, on the island of Trinidad, Aug. 23, 1819.

Persepolis (*per-sĕp'ō-lis*) (Persian city), the Greek name for the capital of ancient Persia — the Persian name having been lost. This city was situated in a beautiful plain near the junction of the Araxes (now Bendemir) and the Medus (now Polwar) rivers. Nothing remains of the city at the present day except its magnificent ruins. It was generally designated as the "Glory of the East," and, according to ancient writers, "no other city could be compared with it either in beauty or in wealth." It was not the residence of Cyrus the Great, but Darius Hystaspis, Xerxes, Artaxerxes, and other Persian kings each contributed something to its wealth and glory. It was nearly or wholly destroyed by Alexander the Great in his conquest of Persia, and is scarcely mentioned in history ever afterward. The site of its royal edifices and temples arouses the interest and enthusiasm of every traveler from Chardin down to our own time.

Perseus (*per'sūs*), in Greek mythology the son of Zeus and Danaë. He was brought up on one of the Cyclades, where Polydectes reigned, who, wishing to get rid of him, sent him when yet a youth to bring the head of the Gorgon Medusa. Perseus set forth under the protection of Athena and Hermes, the former of whom gave him a mirror, by which he could see the monster without looking at her (for that would have changed him into stone), and the latter a sickle, while the nymphs provided him with winged sandals and a helmet of Hades or invisible cap. After numerous wonderful adventures he reached the abode of Medusa, who dwelt near Tartessus, on the coast of the ocean, and succeeded in cutting off her head, which he put into a bag and carried off. On his return he visited Ethiopia, where he liberated and married the beautiful Andromeda, who had been fastened to a rock and left as a prey to a terrible sea monster. He then rescued his mother from Polydectes, whom he turned into stone. Perseus was worshiped as a hero in various parts of Greece, and according to Herodotus in Egypt too. In ancient works of art, the figure of Perseus much resembles that of Hermes.

Persia (*per'shi-a*), called by the natives *Irân*, the most extensive and powerful native kingdom of western Asia, is bounded on the north by the Caspian sea and the Asiatic provinces of Russia; on the east by Afghanistan and Beluchistan; on the south by the Indian ocean, the strait of Ormuz, and the Persian gulf; on the west by Asiatic Turkey. It extends about 900 miles from east to west, and 700 miles form north to south, and has an area of 628,000 square miles. It consists for the most part of an elevated plateau, which in the center and on the east side is almost a dead level, but on the northwest and south is covered with mountain chains.

The climate is exceedingly varied. The younger Cyrus is reported to have said to Xenophon that "people perish with cold at one extremity of the country, while they are suffocated with heat at the other." Persia, in fact, may be said to possess three climates — that of the gulf coast, that of the elevated plateau, and that of the Caspian provinces. Along the southern coast the heat of summer and autumn is severe, while in winter and spring the climate is delightful. On the plateau there is considerable difference of climate, and considerable variation from heat to cold. About Ispahan the winters and summers are equally mild; but to the north and northwest of this the winters are severe, and the desert region of the center and east and the country on its border endure oppressive heat in summer and piercing cold in winter. The Caspian provinces in the north, on account of their general depression below the sea level, are exposed to a degree of heat in summer almost equal to that of the West Indies, and their winters are mild. Rains, however, are frequent, and many tracts of low country are unhealthy. Except in the Caspian provinces, the atmosphere of Persia is remarkable for its dryness and purity.

The cultivated portions of Persia, when supplied with moisture, either by rainfall or irrigation, are very fertile — in some places two crops can be raised in the year. The principal products are wheat (the best in the world), barley, corn, sugar, and rice. The vine flourishes in several provinces, and the wines of Shiraz are celebrated in eastern poetry. Opium and tobacco are now among the considerable exports, together with wool, cotton, and the fine Persian hand-made carpets. Pearl fishing is also a growing industry, together with the mining of turquoises and precious stones. The chief ports are on the Caspian sea and the Persian gulf, and the centers of commerce are Tabriz, Teheran, and Ispahan. Persia has now a system of telegraphs and the beginning of a railway system. Mulberries are largely cultivated, and silk is one of the most important productions of the country. The silk cultivation has greatly diminished of late years, however, on account of the silk-worm disease.

Among the domestic animals the horse, the ass, and the camel hold the first place. The horses of Persia are larger and handsomer than those of Arabia, but less fleet. Salt is the principal mineral product, although copper, lead, antimony, and some other minerals abound in certain localities. Considerable coal has been mined in the mountains near Teheran. The settled portion of the population are chiefly descendants of the ancient Persian race with an intermixture of foreign blood. They are all Mohammedans of the Shêa'h sect, except the Sunnis and the few Parsees, who still retain the ancient faith of

Zoroaster. The nomads or pastoral tribes are of four distinct races—Turks, Kurds, Lurs, and Arabs. Of these nomad races the Turkish is the most numerous, the present Kajâr dynasty belonging to it. The nomad races are distinguished for courage, manliness, and independence of character; but they are inveterate robbers, and have been the cause of many revolutions and civil wars. There is a small population of native Christians—the Nestorians of Urumiah and Telmais, and Armenians, whose principal settlement is at Ispahan. Including those who have joined the Roman Catholic and Protestant churches, the whole number of Christians can hardly exceed 50,000. Christian missions are, however, making steady progress in Persia. The population of Persia is variously estimated at from 9,000,000 to 10,000,000. The chief cities are Teheran, the capital (population 250,000), Tabriz (population 180,000), and Ispahan (population 80,000). The government is a pure despotism, the "shah," or "padishah," possessing absolute authority over the lives and property of his subjects. His deputies, the governors of provinces and districts, possess a like authority over those under them, although they are accountable to the shah, and may be punished by him for any acts that he does not approve. The revenue is derived almost exclusively from a tax on the land and its products, and as a natural result the peasantry are seriously oppressed by the provincial governors. It is believed that great as the legal taxes are, the illegal exactions amount to nearly an equal sum. For the history of ancient Persia, see CYRUS THE GREAT, DARIUS, XERXES; also Rawlinson's *The Seventh Great Oriental Monarchy*.

Per'sian Gulf, an arm of the Indian ocean, lying between Arabia and Persia. Its length is 600 miles, its breadth varying from 50 to 250 miles. Total area, about 75,000 square miles. The order of the periodic currents in this gulf is precisely the reverse of those of the Red sea, as they ascend from May to October, and descend from October to May. The greatest depth of the Persian gulf does not exceed 50 fathoms. Oriental geographers give to this gulf the name of the "Green sea," from the strip of water of a greenish color lying along the Arabian coast.

Persigny (*per-sēn-yē'*), **Jean Gilbert Victor Fialin,** an adherent of Napoleon III., was born at Saint-Germain l'Espinasse, Jan. 11, 1808. He entered the cavalry school at Saumur in 1826, and the 4th Hussars in 1828, but was expelled from the army for insubordination in 1831. In 1834, he became acquainted with Louis Napoleon, and established a journal devoted to the advocacy of Bonapartist principles. He had the chief hand in the affair of Strasburg, in 1836; and in 1840, he participated in the descent on Boulogne, for which he was sentenced to 20 years' imprisonment. Persigny was very active in securing the election of Louis Napoleon as president of the republic in 1848; and he also took a prominent part in the *coup d etat* of December, 1851. He filled various offices under Napoleon III., until 1853, when he was created duke. He then sat in the senate until the fall of the empire in 1870. He died at Nice, Jan. 12, 1872.

Persim'mon, a tree from thirty to sixty feet in height, which yields a fruit about the size of a plum, with six to eight oval seeds. It is very astringent until over-ripe and mellowed by frost, when it has a sweet and agreeable taste. It is a native of the southern portions of North America, where one tree often yields several bushels of fruit.

Persius (*per'shi-us*), **Aulus Flaccus,** a Roman satirist and poet, was born in Etruria, Dec. 4, 34 A. D. He was educated in his native town, but in early manhood went to Rome, where he received instruction from the Stoic philosopher Cornutus, who imbued his mind with the tenets of that school and exerted a marked influence upon his life and character. Persius died in the year 62, when twenty-eight years old, and was distinguished in a marked degree for the purity and integrity of his character. He left at his death six brief satires, the whole not exceeding 650 hexameters; but these have been held in high esteem down to our own day, fathers of the church, like Augustine and Jerome, and humanists, like Buchanan and Casaubon, finding employment in interpreting the poet's ridicule of the degeneracy of his times. "Probably no writer ever borrowed so much and yet left on the mind so decided an impression of originality," says Covington, who further indicates the resemblance between the genius of Persius and that of Carlyle.

Perth Am'boy', N. J., a city and port of entry in Middlesex county, situated at the mouth of Raritan river, where it falls into Raritan bay, at the foot of Staten Island sound, 20 miles south of New York city. It is reached from the latter by a number of railroads, chiefly by the Central of New Jersey, the Pennsylvania, and Lehigh Valley railroads. Deposits of kaolin and fire-clay are found in the city, and give employment to terra-cotta, drain-tile, and fire and glazed brick works, etc. There are also machine-shops; iron foundries; chemical, emery, and cork works; oil-refineries, together with the large coal and freight wharves of the Lehigh Valley railroad, abutting on the fine harbor. There are good schools, churches, banks, and other civic equipments. Population 17,699.

Perth, a city of Scotland, on the right bank of the Tay, 43 miles from Edinburgh and 62 miles from Glasgow. The great beauty of its surroundings—the noble river, the two wooded heights, Moncreiff and Kinnoul hills, each 700 feet high, and away to the north, the Grampians—makes the "Fair City" well worthy the name. A handsome bridge of nine

arches connects the city with the suburb of Bridgend, where Ruskin spent a portion of his childhood. Along the bank of the Tay extend two beautiful public parks, each containing nearly 100 acres.

The *Five Articles of Perth*, memorable in the ecclesiastical history of Scotland, were agreed upon in a meeting of the general assembly, by command of James VI., in 1618. They enjoined kneeling at the Lord's Supper, the observance of Christmas, Good Friday, Easter, and Pentecost, and sanctioned the private administration of baptism and the Lord's Supper. These articles became one of the chief subjects of that contention between the king and the people which produced such serious results in the succeeding reign of Charles I. The general assembly of Glasgow in 1638 declared that of Perth to have been "unfree, unlawful, and null," and condemned the five articles. The population of Perth in 1900 was 30,820.

Peru, a republic of South America, bounded on the north by Ecuador, on the east by Brazil and Bolivia, on the south by Chile and the Pacific ocean, and on the west by the Pacific. Its area is not definitely known, but may be estimated at about 695,733 square miles. The population, not including wild Indians, according to a census made in 1896, was 4,609,999, the aboriginal Inca Indians constituting over fifty per cent. of this number. The length of Peru along the Pacific coast is nearly 1,500 miles; its breadth at its northern boundary is between 700 and 800 miles, while at the southern boundary it is less than 100 miles. The surface of Peru is divided into three distinct tracts, the climate of which varies from torrid heat to arctic cold, and whose productions range from the stunted herbage of the mountain slopes to the rich fruits of the tropical valleys. These three separate regions are the Coast, the Sierra, and the Montaña. The Coast is a strip of land from 30 to 60 miles in width, extending from the western Cordillera to the Pacific ocean. It is for the most part a sandy desert, but it contains many fertile valleys watered by streams that have their sources on the slopes of the Cordilleras. Between these valleys are trackless deserts of greater or less width, covered with a shifting, yellow sand, which is often carried about by the wind in pillars 100 feet high. In the Coast region, rain is unknown. This is due to the fact that the southeast trade winds of the Atlantic, after traversing the continent from its eastern coast, exhaust their remaining moisture in covering the Cordilleras with snow, after which they fall upon the western coast of Peru cool and dry. The Sierra embraces all the region between the eastern and western Cordilleras and the two ranges of the Andes. This region averages 100 miles in width, and has been estimated to contain an area of 150,000 to 200,000 square miles. After the tablelands of Thibet, those of Peru are the highest in the world. Unlike those of Thibet, which are mere grassy uplands, they are studded with towns and villages; and even at this elevation the climate is pleasant, and wheat, corn, barley, rye, and potatoes are produced in no insignificant quantities. At the height of 9,000 feet above the sea level, the mean temperature is 60° Fahrenheit, and the variation throughout the year is not great. The soil of the Sierras is of great variety, but is generally fertile.

The Montaña region extends eastward from the Andes to Brazil and Bolivia. It embraces more than half the area of Peru, and almost its only inhabitants are a few scattered tribes of Indians. It consists of vast forests and alluvial plains, is rich in all the productions of tropical latitudes, and teems with vegetable and animal life. The wealth of Peru consists entirely in mineral, vegetable, and animal products. The chief exports are cotton, coffee, and sugar. Maize, cocoa, rice, and tobacco are also among the exports. Wood, alpaca, and rubber are with guano exported products, together with bar silver, gold, copper, and lead. The Andes abound in gold, silver, copper, lead, etc.; and in the Montaña region, gold is said to exist in abundance in veins and in pools on the margins of rivers. The public revenue is derived mainly from the sale of guano, and only to a small extent from customs.

Peru was under the dominion of Spain from the time of its conquest by Pizarro in the 16th century until the year 1821, when it was proclaimed an independent republic under the protectorate of General San Martin, one of the liberators of Chile. San Martin retired on the arrival of Gen. Simon Bolivar in 1823, and the next year occurred the battle of Ayacucho, in which the Spanish viceroy was taken prisoner, and the Spanish dominion finally came to an end. Bolivar left Peru two years later, but it was not until 1844 that the government was fully settled under the presidency of Ramon Castilla. In 1879, Peru, as the ally of Bolivia, became involved in a war with Chile, the latter state coveting the nitrate deposits in the Peruvian province of Tarapacà. This war was disastrous to Peru on both land and sea, the provinces of Tacna and Tarapacà being wrested from her, and in 1881 the Chilean army entered Lima, the capital. Peace was concluded in October, 1883, and some months afterward the Chileans evacuated the country. Under the presidency of General Càceres and his successor, Col. Don Remijio Morales Bermudez, Peru made slow but certain progress in repairing the wastes and losses that she suffered during her conflict with Chile.

Perugia (*pā-rō'jā*), a city of Italy, stands on the right bank of the Tiber, 1,700 feet above the level of the sea, ten miles east of the lake of Perugia, and 125 miles by rail

from Rome. It is surrounded by walls pierced with numerous gates, of which the Etruscan arch of Augustus is the finest. The university (founded in 1276) has 26 teachers and 320 students, a botanical garden, an observatory, a valuable antiquarian museum, and a library of 40,000 volumes. Perugia became a part of the kingdom of Italy in 1860, and has a population of 61,292.

Perugino (*pā-rū-jē'nō*), a celebrated Italian painter, whose real name was Pietro Vannucci, was born in Umbria in 1446, but as he established himself in the neighboring city of Perugia, he has generally been given the name of Perugino. At Rome, to which place he went in 1483, Pope Sixtus IV. employed him in the Sistine chapel; his fresco, *Christ giving the Keys to Peter*, is the best of those still visible — others being destroyed by him to make way for Michael Angelo's *Last Judgment*. He returned to Perugia in 1512 and painted a number of pictures there. He was engaged in painting frescos in a church near Perugia in 1524, when he was seized with the plague, of which he died.

Pessimism (*pes'sim-ism*), is the theory or doctrine that on the whole the world is bad rather than good; or, it might be defined as the negative answer to the question, "Is life worth living?" Pessimism in its hold upon so many minds may be referred to the contemplation of actual pain and unhappiness in the world, and also to the fact that the actual world is so far inferior to the ideals of the human soul that we can never be satisfied with things as they are, or even with the progress mankind is making toward a higher and better condition. Pessimism as a mood or temper of mind has existed in all ages of the world, but it is only in recent times that it has been elaborated into a complete philosophy or theory in the systems of Schopenhaur and his successor, E. von Hartmann. The full force of pessimism lies in the assertion that all the ends and aims of life are illusory, that life brings only illusions, the chief illusion of all being man's belief that he is born to enjoy life. According to the pessimistic theory, nothing of value is ever attained in this world, as its very essence consists in strife and change, and in the case of the individual life there is an excess of unhappiness and pain over happiness and pleasure. To the first of these statements, that nothing of value can be attained in this world, it may be answered that it is not rational to despise the realization of certain ends because there arise other ends to be realized. It is natural and therefore rational for the infant to enjoy its first walk across the floor even though it has all the lessons of life yet to learn. The assertion that in the individual life there is more pain than pleasure is disproved by our consciousness and our experience. We desire to live, therefore our lives must be worth living, at least to ourselves. But whatever errors may be found in pessimism, it certainly involves the truth that happiness is not to be obtained by direct seeking, and that life can be made valuable only by losing sight of self and directing our thoughts and energies to high and noble purposes without ourselves; or, to express the same principle in scriptural phrase, "He that loseth his life shall find it."

Pestalozzi (*pes-tä-lot'sē*), **Johann Heinrich,** a Swiss educational reformer and founder of modern pedagogy, was born at Zurich, Jan. 12, 1746. Eager to be an adjuster of social wrongs from his youth, he sought to realize his aims through the education of the young, and to him belongs the high honor of conceiving a method which is the corner stone of all sound theories of education, especially of primary education. Although he was illiterate, ill-dressed, a poor speaker, and a poor manager, and although all his undertakings resulted in practical failure, he yet aroused the admiration of Europe, and called forth a host of disciples, who down to the present day have carried out the principles of their master with the greatest enthusiasm. Pestalozzi was totally unable to cope with the world, but he awoke the minds of men to a sense of their responsibility to childhood, and ushered in the 19th century as the educational age *par excellence*. He first sought to carry out his theories by collecting a number of orphans and outcast children upon a farm in the canton of Aargau to educate them by a blending of industrial, mental, and moral training; but on account of a faulty domestic economy this enterprise failed, and was abandoned after a five years' struggle. Soon after this he published his *Evening Hours of a Hermit*. In this work he developed the following principles as the basis of education: In educating man, seek first of all to *know* him; the method whereby to educate anyone should be founded upon his own nature; in his nature are hidden the forces that will draw out his faculties, therefore exercise them; it is exercise that connects the wants of our nature with the objects that satisfy those wants, and everyone's education should answer to his own needs and the inner call of his or her soul. In later years, Pestalozzi published his work *How Gertrude Educates Her Children*, which is the recognized exposition of the Pestalozzian method, and sets forth that the education and development of human nature should be in harmony with natural laws; that in order to teach well, we should study the processes of nature in man and its particular processes in individuals, and that *observation*, which is a spontaneous perception of things, is the method by which all objects of knowledge are brought home to us. This last affirmation contains the essence of the whole theory of institutional education. In 1805, Pestalozzi moved his school from Berthond to Yverdon, which drew upon him the eyes of all Europe; but the same incapacity in practical affairs that had caused the failure of all his other

schemes showed itself here, and in 1825 this school was closed, and Pestalozzi withdrew to Brugg, where he lived an object of mingled pity and respect until his death, which took place Feb. 17, 1827.

Pesth, or rather Budapest, the capital of Hungary, and next to Vienna, the second city in the Austro-Hungarian empire. Pesth stands on the left bank and Buda on the right bank of the Danube, 170 miles from Vienna, and since 1873 the two cities have been united in one municipality. The two towns are connected by chain bridges and a railway bridge. Buda is much the older town, Pesth being an essentially modern place — the growth of the 19th century principally. It has many fine streets and squares, and the buildings are noted for their large size and substantial appearance. Among them may be mentioned the Jewish synagogue, the parish church, the national museum, the parliament house, etc. While Pesth stands on a plain, Buda is built on small, steep hills, and is backed by vine-clad slopes. Population of both towns in 1890, 505,763. See BUDAPEST.

Pet'als, the individual parts of the corolla, or inner set of floral leaves. The petals are usually the showy members of a flower, their size, delicacy of texture, and color giving it its character. See FLOWER.

Petard (*pē-tärd'*), an instrument for blowing open the gates of a fortress, demolishing palisades, etc. It consisted of an iron or wooden case filled with powder and ball; this was firmly fastened to a plank provided with hooks, by which it was securely attached to a gate. The petard, which was lighted by a slow match, has been superseded by powder bags.

Pe'ter, St., one of the twelve apostles of Jesus, was born at Bethsaida, on the sea of Galilee, but during the public ministry of Jesus, had his home at Capernaum, where he appears to have lived with his brother Andrew. His original name was Simon, to which Jesus added Cephas, from the Syriac *kepha*, "a rock," the Greek word for the same meaning *petra*, whence Peter. He was a fisherman, and was engaged in his daily work when Jesus called both him and Andrew to be his disciples, promising to make them "fishers of men." Peter was undoubtedly regarded by Jesus with special favor and affection. In many respects he was an ideal disciple, warmly attached to his master, and ardent, fearless, and energetic in the service of the cause he had espoused. It is not without reason, therefore, that Matthew heads his list of apostles with "the first, Simon, which is called Peter." This position of leadership among the apostles Peter continued to hold. Peter was the first mover in the election of a new apostle in place of Judas Iscariot; he was the spokesman of the other apostles on the day of Pentecost, and when they were brought before the council, he was the judge who condemned Ananias and Sapphira, and he was the first apostle to baptize a Gentile convert.

Peter took an active part in the apostles' council or conference in Jerusalem, and at Antioch he labored in harmony with Paul for a time, but afterward arose the famous dispute between them, in which Paul says "he was to be blamed" for separating himself from the Gentile converts, and refusing longer to eat with them, lest he might give offense to certain Jewish converts. The history of Peter from this time rests mainly on tradition. It is generally believed that after remaining in Antioch for some time — according to Jerome and Eusebius, he was bishop there for several years — his missionary labors extended to Pontus, Cappadocia, Galatia, and Bithynia and, some have thought, even to Babylon. It is now generally conceded that he paid one or more visits to Rome, and that he suffered martyrdom there. Tradition records that Peter was crucified with his head downward, he himself requesting this, as he was not worthy to be crucified in the same position as his Lord and master.

Pe'ter the Great (Peter I., Alexeievitch, emperor of Russia), was born at Moscow, June 11, 1672. His father died in 1676, leaving the kingdom to his eldest son, Feodor, Peter's half-brother. Feodor died in 1682, without issue, after naming Peter as his successor, to the exclusion of his own full brother, Ivan, who was weak-minded. This, however, provoked an insurrection of the "strelzi," or militia, under the leadership of Ivan's sister, the grand duchess, Sophia, who thereby succeeded in obtaining the coronation of Ivan and Peter as joint rulers, with herself as regent. Immediately after his coronation Peter was placed under the instruction of François Lefort, a native of Geneva, who taught him the various arts and sciences of civilization, and showed him how far Russia was behind other European nations in all these. In the year 1689, Peter called upon his sister Sophia to resign her position as regent, which she refused to do; but after a severe contest, she was compelled to yield, and was shut up in a convent, where she remained until her death, in 1704. Ivan abdicated his share of the government in 1696.

PETER THE GREAT.

Peter's first care in assuming the government was to reorganize his army, in which he was greatly assisted by Gordon and Lefort,

both military men. He also labored to create a navy, and to this end invited skilled engineers and architects from other countries to assist in the construction of his ships; and he himself went to sea on board English and Dutch vessels that he might acquire the art of navigation. Many of the young nobility were ordered to travel in Holland and Italy, to take special notice of all matters in connection with shipbuilding and naval equipment; others were sent to Germany to study the military art. In 1697, Peter set out on his famous tour or visit to foreign countries, and worked for some time as a ship carpenter at Zaandam, in the Netherlands, and to his knowledge of shipbuilding and other trades added the study of astronomy, natural philosophy, geography, and even anatomy and surgery. On the invitation of William III., he visited England and for three months, partly in London and partly in Deptford, labored to acquire all kinds of useful information. He returned to Russia in 1698, taking with him five hundred English engineers, artisans, etc., and immediately proceeded to the execution of various reforms in his government. Among others was the introduction of arithmetic, which was unknown in Russia up to this time, accounts having been previously kept by means of the abacus, an instrument consisting of a frame with a number of parallel wires on which beads or counters are strung. Trade with foreign countries was not only permitted but insisted upon. Many changes in manners and dress were also prescribed and enforced on the people, and the czar's reforming zeal even extended to the national church.

On May 27, 1703, Peter laid the foundation of the new capital of Russia, St. Petersburg, being at the time engaged in a bitter war with Charles XII. of Sweden. In this long contest, the Russians were nearly always defeated, but at the battle of Pultowa, July 8, 1709, Charles' forces were completely routed, and Peter took possession of the Baltic provinces and a portion of Finland in the next year. In 1712, his marriage with his mistress Catharine was celebrated at St. Petersburg, and all the offices of the central government were transferred to the new capital. In company with the czarina, he made another tour of Europe in 1716–17, this time visiting Paris and carrying home with him quantities of books, paintings, statues, etc. Soon after this his son, Alexei, who had opposed some of his father's reforms, was condemned to death and died in prison. Many nobles implicated in his treasonable plans were punished. After concluding peace with Sweden, in 1721, Peter made war upon Persia, in order to open the Caspian sea to Russian commerce, by which he secured three Caspian provinces and the towns of Derbend and Baku. The last years of his life were chiefly employed in improving his capital and carrying out his plans for the diffusion of education among his subjects. He died at St. Petersburg, Feb. 8, 1725, and was succeeded by his empress, under the title of Catharine I.

Pe'ter II. (of Russia), the sole male representative of Peter the Great, being the son of the unfortunate Alexei (see above), was born at St. Petersburg, Oct. 23, 1715. On the death of the czarina, Catharine I., he ascended the throne, in 1727, but after a reign of a little over two years, died of the small-pox, Jan. 29, 1730.

Pe'ter III. (Feodorovitch, of Russia), grandson of Peter the Great, being the son of his eldest daughter, Anna Petrowna, was born at Kiel, Jan. 29, 1728, and in 1742 was declared by the czarina Elizabeth her successor on the throne of Russia. Peter succeeded Elizabeth, on her death in 1762, and his first act of authority was to restore East Prussia to Frederick the Great, whom he greatly admired, and to send to his aid a force of 15,000 men. He also recalled a great many political exiles from Siberia. While he was arranging a campaign to take Sleswick from Denmark, soon after his inauguration, an insurrection, headed by his wife and the principal nobles, broke out against him in St. Petersburg, a conspiracy which originated in the discontent over his liberal policy, his preference for the Germans, his indifference to the national religion, and his servility to Frederick the Great. The result of this conspiracy was that Peter was declared to have forfeited his crown, and was soon after strangled in his bed, in 1762, by Orloff and other conspirators. He was succeeded by his wife as Catharine II.

Pe'ter the Her'mit, the apostle of the first crusade for the recovery of Jerusalem from the Mohammedans, was born at Amiens, France, about the year 1050. After serving some time as a soldier he became a monk, and is said to have made a pilgrimage to the Holy Land before the year 1094, when he began the preaching campaign which started so many thousands on the famous march to Jerusalem. A portion of the first crusade army was led by Peter himself, but at the siege of Antioch he attempted to desert, and, when several miles on his way home, was brought back by the soldiers of Tancred to receive a public reprimand. When Jerusalem was taken by the crusaders, the next year, Peter preached a sermon to them on the Mount of Olives. At the end of the crusade, he returned to Europe and founded a monastery at Huy, in Belgium, where he died July 11, 1115.

Pe'ters, Christian Henry Friedrich, a highly-distinguished American astronomer, was born at Koldenbüttel, Germany, Sept. 19, 1813. After completing his course at the University of Berlin, he traveled for several years in Palestine and other countries in the east. He then came to the United States,

and after serving in the coast survey, was elected professor of astronomy at Hamilton college, New York, in 1858. In 1859, he determined accurately the longitude of his observatory, as well as that of other places in the state of New York, and of the observatory of Ann Arbor, Mich. Professor Peters took part in the observation of the solar eclipse of Aug. 7, 1869, at Des Moines, Ia., and was at the head of the party sent by the United States government to New Zealand to observe the transit of the planet Venus, which took place Dec. 9, 1874. His party obtained over 200 photographs of the transit, and he was able to measure the apparent diameter of the planet, thus determining its size more nearly than had ever been done before. He died at Clinton, N. Y., July 18, 1890.

Pe'tersburg, the third city of Virginia, on the left bank of the Appomattox river, 23 miles by rail south of Richmond. The falls above the city furnish water-power for foundries, cotton, flour and paper mills, and tobacco factories. The "Siege of Petersburg," which lasted ten months, was an important chapter in General Grant's campaign against Richmond in 1864. Although attacked several times, it did not fall until it was evacuated by the Confederate forces in the spring of 1865. Population 21,810.

Pe'ter's Pence, a name of a **tax**, for the benefit of the pope, in memory of St. Peter. Its origin has been ascribed by some to Ina, king of Wessex, by some to Offa of Mercia, and by others to Alfred the Great. It consisted in the payment of a silver penny, by every family possessing land or cattle of the yearly value of 30 pence. The tax, also called Rome-scot, varied in amount, and continued to be paid until the Reformation. The pope having suffered a great loss of revenue by the revolution of 1848, efforts have been made since that time to revive the payment of Peter's Pence, not as a tax, but by the collection of freewill offerings. In some countries this has been largely successful; and since the annexation of the papal states to the kingdom of Italy, the fund has been largely increased. On the occasion of the jubilee of Pius IX., in 1877, the payment amounted to $3,000,000.

Pet'iole, the stalk-like portion of a leaf, as distinguished from the blade. Leaves without petioles are said to be "sessile." See LEAF.

Petiolule (*pĕt'ĭ-ō-lūl*), in compound leaves the stalk-like portion of a leaflet, as distinguished from the general stalk or petiole of the whole leaf.

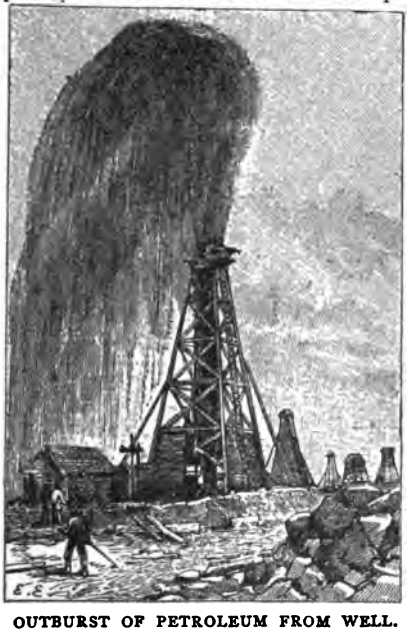
Petrarch (*pĕ'trärk*), **Frances'co,** one of the earliest and greatest of modern lyric poets, was born at Arezzo, Italy, July 20, 1304, his parents being exiled from Florence at the time. The poet's infancy was passed in Tuscany, until 1312, when his father determined to go to Avignon, whither the papal court had been transferred. There his studies began, and were continued later at Montpellier and Bologna. His father intended him for the legal profession, but instead of the law, he devoted himself to the study of the Latin classics, the two authors on whose style he strove to model his own being Cicero and Virgil. After his father's death, Petrarch returned to Avignon, and having lost a large portion of his patrimony, qualified himself for ecclesiastical preferment, but never took holy orders. It was in this early period of his life that he first saw Laura, whose name he has immortalized in his lyrics, and who inspired him with a passion which, although unrequited, has become proverbial for its constancy and purity. The identity of Laura has been a subject of considerable discussion, but the most generally-accepted theory is that of the Abbé de Sade, who identifies her as Laure de Noves, the wife of Hugo de Sade, and the mother of eleven children. The fame of Petrarch's learning and genius was such that he received the highest consideration from all the rulers and the learned men of his age; but the most glorious day of his life was when he was crowned poet-laureate by the senate of Rome on Easter Sunday, 1341. After the death of his beloved Laura, and his friend, Cardinal Colonna, he left Avignon, disgusted with the vices and corruptions of the court. The remaining years of his life were passed in various towns of northern Italy, and in his country house near Padua, where, tenderly cared for by his natural daughter, Francesca, and her husband, and occupied to the last in his favorite studies, he died, July 18, 1374. See Henry Reeve's little book on Petrarch.

Pet'rel, the name for small sea birds often seen flying over the ocean. They are commonly called Mother Carey's chickens by the sailors. There are two kinds seen in the North Atlantic — Wilson's petrel and Leach's. The former nests in the southern hemisphere in February, and comes north in May. It is the form most frequently seen in crossing the Atlantic. They follow the ship for food thrown overboard. Leach's petrel nests on our coast from Maine northward. Both these birds are small, being about seven and one-half inches long. They are black with a white spot on the upper side at the base of the tail. In all, there are about seventy species of petrels. Several inhabit the southern seas, and the group includes the giant fulmar, about the size of one of the smaller albatrosses. The name petrel is a diminutive of Peter, and refers to the appearance they present of walking on the water.

Pe'trie, William M. F., an English author and explorer, was born at Charlton, England, June 3, 1853. Having been educated privately, he early devoted himself to a study of ancient British earthworks, but in 1880 turned his attention to the Nile valley, where he has

practically been ever since, although holding a professorship in the University college, London, in the department of Egyptology. He discovered the Greek settlements at Naukratis and Daphnæ; the prehistoric Egyptian settlement at Koptos, and the home of a new race at Nagada. He published an inscription of the Israelite war at Thebes. During the 20 years he has been at work in Egypt, he has published no less than 21 volumes bearing upon the life and history of the ancient Egyptians. Perhaps that which attracted the most attention throughout the whole world of scholars was the report of his work at Tel-el-Amarna, a modern Arab village on the east side of the Nile, midway between ancient Thebes and Memphis, where Amenophis IV., the "heretic" king, built his royal residence about 1500 B. C. A great many tablets in cuneiform characters were here found, which are now in the museums of London, Berlin, and Cairo. These are mostly reports from the east, and contain many names known to Bible students.

Petro'leum, a fluid form of bitumen, also known as mineral oil, rock oil, etc. In nature it occurs principally in the pores of porous rock. It is extracted from the rock through wells, the same as water. The origin of petroleum has been much discussed, and the general belief is that it represents a distillation product of organic matter which was buried in the sediments when they accumulated. It is quite probable that both animal and plant



OUTBURST OF PETROLEUM FROM WELL.

matter have contributed to the production of petroleum. In the case of profitable petroleum wells, the porous layer containing the petroleum is usually covered by a relatively impervious layer, which prevents the oil from escaping upward. When the well boring penetrates this impervious layer, the oil has a chance to escape. It sometimes spouts up with great force, like the water in flowing wells. In other cases, it has to be pumped out. A well which flows when it is first made, often ceases to flow at a later time, and the oil then has to be pumped out. Still later, it may cease altogether to yield oil, because the reservoir (the porous rock) from which it drew its supply, is exhausted. The average length of life of an oil well is but a few years. The yield from wells is very variable, some of them yielding but a few barrels a day, while others yield hundreds, or even thousands, of barrels a day. Such extraordinary flows are usually of short duration.

Petroleum is found in various parts of the world. The following table shows the sources of the larger part of the product for the United States in 1898: —

	BARRELS.
Ohio	18,738,708
Pennsylvania	14,743,214
West Virginia	13,615,101
Indiana	3,730,907
California	2,257,207
New York	1,205,250
Texas	546,383
Colorado	444,070
Kansas	71,980

Recently (1901) extensive finds of petroleum have been made in southeastern Texas, near Beaumont. This oil field is yet but slightly developed, but appears to be most promising. The wells here are less than 1,000 feet in depth. That is about the same as the shallower wells of southeastern Ohio and West Virginia. The oil flows from some of these wells under tremendous pressure. It is estimated that in one case it was shot up into the air as high as 600 feet, and that for a time the flow amounted to as much as 1,000 barrels an hour. (See *Engineering and Mining Journal*, Jan. 26, 1901).

Petroleum occurs in formations of various ages. That of western Ohio, Indiana, Michigan, and Canada occurs in rocks of the Ordovician system; that of Tennessee and Kentucky, in the Silurian; that of New York and Pennsylvania, in the Devonian; that of West Virginia and eastern Ohio, in the Lower Carboniferous; that of Kansas, in the Carboniferous; that of Texas and the Western States, in the Cretaceous and Tertiary formations. The petroleum, as it is derived from the wells, is crude, and is subjected to refining processes before it is put on the market.

See Orton: *Geology of Ohio*, Vol. VII.; *U. S. Geological Survey*, 8th Annual Report, Part I.; *Bulletin of the Geological Society of America*, Vol. I.

Pet'tie, John, a Scottish artist, was born at East Linton, near Haddington, in 1839, and early became a student of art in the Scottish academy. His first exhibited pictures were *The Prison Pet*, at Edinburgh in

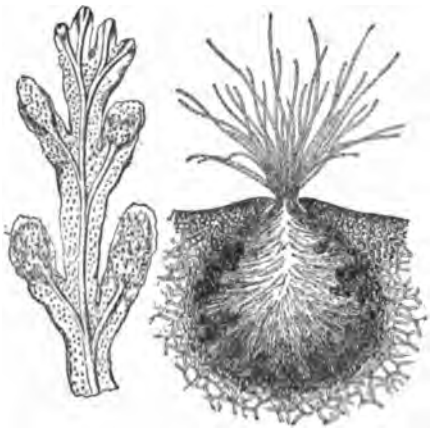
1859, and *The Armorers* at the Royal academy in 1860. But the first work which showed the high qualities of his genius was *A Drumhead Court-Martial*. He died at Hastings, Feb. 21, 1893.

Pet'ty Officers in the navy correspond to non-commissioned officers in the army.

Pe'wee (or Wood-pewee), a small fly-catcher sometimes confused with the phœbe. It is smaller than the latter, being about six and one-half inches long. It is dark olive-green above and whitish below, washed with dusky. The under bill is yellow. It is a gentle forest bird, with a plaintive note of *pe-wee-ee*. See PHŒBE.

Phædrus (*fē'drus*), translator of Æsop's "Fables" from Greek into Latin verse. While still young he came to Italy, and in Rome or some other city studied Ennius, whom he quotes in the epilogue to his third book. From the title of this book he appears to have been first the slave and afterward the freedman of Augustus Cæsar. Although Phædrus only claimed to be a translator of Æsop, he was more than that; he wrote fables of his own, using the name of Æsop to recommend his verses. Phædrus lived in the early part of the first century A. D.

Phæophyceæ (*fē-o-fī'sē-ē*), plants forming one of the great groups of algæ, commonly known as the brown algæ or "kelps." They are almost all marine, and



FUCUS OR ROCKWEED.

The figure to the right shows the receptacle which contains the sex organs.

are very characteristic forms of the coast. They are all anchored forms, their floating olive green, yellow, or brown bodies usually being buoyed up by floats or air-bladders. The largest kelps are in the colder waters, and are also called "wrack," "tangle," "dangle," etc.

Some of them are filamentous forms, but others are very much more complex. The species of Laminaria are like huge floating and rooted leaves, frequently nine to ten feet long. The largest known Laminaria is an Antarctic form, which rises to the surface from a sloping bottom, with a floating leaf-like body 600 to 900 feet long. Other forms rise from the sea-bottom like trees, with thick trunks, numerous branches, and leaf-like appendages. One of the most common forms is the "rockweed" or fucus, whose forking body is full of swollen air-bladders. The noted Sargassum or "gulf weed" is a member of this group. It is often torn from its anchorage by the waves and carried away from the coast by currents, collecting in the great sea eddies produced by oceanic currents, and forming the so-called "Sargasso seas," as that of the North Atlantic.

Phaethon (*fā'e-thon*), "the shining one" in the writings of Homer and Hesiod, a frequent title of Helios, the sun-god. In Greek mythology Phaethon is also the name of a son of Helios, famous for his unfortunate attempt to drive his father's chariot. Scarcely had the presumptuous youth seized the reins when the horses, perceiving his weakness, ran off, and approaching too near the earth, almost set it on fire. The earth then called upon Jupiter for help, and he struck down Phaethon with a thunderbolt. His sisters, who had harnessed the horses of the sun for him were changed into poplars and their tears into amber.

Phal'anx, the ancient Greek formation for heavy infantry, was a series of parallel columns standing close one behind the other. The oldest phalanx was the Spartan, in which the soldiers stood four, six, or more, generally eight, deep. The Macedonian phalanx was sixteen men deep. The heavy-armed phalanx was ordinarily flanked by *peltastes*, or light infantry, who usually fought with javelins and slings.

Phanerogams (*făn'er-ō-gămz*), a name commonly applied to the spermatophytes or seed plants, but now passing into disuse. It was given in contrast to cryptogams (which see), and means that the sexual reproduction is evident, the stamens and pistils being mistaken for sexual organs. See SPERMATOPHYTES.

Pharaoh (*fā'rō* or *fā'ra-ō*), the name or title given in the Bible to the monarchs of Egypt. Although the term is only an official title, it is generally used as if it were a proper name; and there has been great difficulty in determining the particular monarchs who pass under this name in the Old Testament.

Phar'isees, a Jewish sect or school distinguished for their devotion to the Law and their rigid observance of all the rites and ceremonies of the Jewish church. The name of Pharisees—from *perûshim*, "separated"—was probably at first bestowed upon them in derision by the Sadducees, the priestly

aristocracy, who differed from them politically, and to some extent, religiously. The Pharisees believed in future immortality, while the Sadducees held that there was nothing in the Scriptures to warrant it. Also the Pharisees held all the traditional ordinances in equal reverence with the Mosaic institution, while the Sadducees rejected many traditional observances or varied them according to the traditions of their own families. In general, the Pharisees administered justice in a much milder manner than the Sadducees, as the latter took their stand upon the strict letter and would hear of no mercy when the code was clearly violated. Out of the Pharisees arose the great doctors and teachers of the law, usually termed "Scribes," and to them the most important offices were intrusted by later rulers. That the Pharisees as a body were actuated by a sincere and patriotic purpose to preserve the religion of their fathers from corruption and foreign contamination must be admitted; but it is also very clear that in their intense devotion to the letter of the law and the traditions of the elders, they lost sight of its spirit, and were therefore wholly unprepared for the coming of that Messiah whose kingdom was a spiritual kingdom, and who said to his disciples: "The words that I speak unto you, they are spirit, and they are life."

Pheas'ant, a long-tailed game bird, related to the partridge. There are about forty species of pheasants, mostly large birds, with brilliant colors, showing metallic luster. Among their colors are gold, copper, scarlet,

PHEASANT.

green, and blue. They are mostly natives of Asia and live in dense woods. The so-called English pheasant was naturalized in Great Britain before the Norman conquest, and is bred in the game preserves of Europe. It has also been introduced into the United States. The male has metallic tints of blue and green on the breast. It is about three feet long, including the tail, which represents one-half the length. The copper pheasant of Japan, and the ringed-neck pheasant of China, have been introduced into western Oregon. The pheasants of China, Thibet, India, and islands of the Malay archipelago are often very gorgeous in plumage. The golden pheasant of China and Thibet is very striking, being mostly golden above, and scarlet below, with a ruff of orange and black. The silver pheasant is silvery white above, penciled with black. Both these birds have been introduced into Europe. The tail is sometimes very long, for example, in Reeve's pheasant of China, it is five and one-half feet long. This bird is found in the game preserves of Europe. The ruffed grouse of North America is incorrectly called pheasant. See Elliot's *A Monograph of the Phasianidæ;* Tegetmeier's *Pheasants: their Natural History and Management.*

Phelps, Edward J., an American jurist and diplomat, was born at Middlebury, Vt., July 11, 1822; educated at Middlebury college, and graduated in law at Yale in 1843. He was admitted to the bar at his old home in the same year. In 1851, he was appointed second comptroller of the United States treasury. He was a delegate to the constitutional convention of Vermont in 1870; president of the American Bar association in 1880; and Democratic candidate for governor of the state in that year. He became a professor in the law school of Yale in 1881, where he served until appointed minister to Great Britain in 1885. Mr. Phelps remained at the court of St. James until the incoming of the Republican administration in 1889. He was appointed in 1893 one of the counsel in the court of arbitration in the Bering sea controversy, to represent United States. He died at New Haven, Conn., March 9, 1900.

Phelps, Elizabeth Stuart (Mrs. Herbert D. Ward), an American authoress, was born at Andover, Mass., Aug. 31, 1844, her father being Professor Austin Phelps of the Andover Theological seminary, and her mother the daughter of Professor Moses Stuart of the same institution. Besides lecturing, writing for magazines, and engaging in various kinds of work for the advancement of women, she has written a number of novels, including *Gates Ajar* (which passed through several editions in the year of its publication), *Beyond the Gates, Hedged In, The Silent Partner, An Old Maid's Paradise, The Gates Between, Doctor Zay* (in which the question of professional life for women is considered). In 1888, she married Rev. Herbert D. Ward, and since that time in connection with him has written and published *The Master of the Magicians*, and other popular works.

Phelps, William Walter, was born at New York, Aug. 24, 1839, and graduated at Yale college in 1860. After taking a full course of study at Columbia Law school, he entered on the practice of the legal profession at Englewood, N. J., where he also became engaged in extensive business enterprises and acquired great wealth. In 1872, he was chosen fellow of Yale college by the alumni of that institution, and in 1872 was elected a member of congress, in which body he rapidly distinguished himself by his ability and efficiency.

In 1881, he was appointed by President Garfield minister to Austria, and was again elected to congress in 1882, continuing to serve in that body until appointed minister to Germany by Harrison (1889–93). He died at Englewood, N. J., June 17, 1894.

Phen'ogams, a corruption of phanerogams.

Phi Beta Kappa, a collegiate Greek letter fraternity composed of the first third of the senior class in American colleges. It takes its name from the initial letters of its motto, *Philosophia Biou Kubernetes*, "Philosophy is the guide of life." This society was founded in 1776, in the old "Raleigh Tavern," at Williamsburgh, Virginia, by 44 under-graduates of William and Mary college, of whom John Marshall, afterward chief-justice of the United States, was one. Branches were established at Yale in 1780, and at Harvard in 1781, and since then chapters have been formed in many of the universities and colleges of the country, with an active membership, in 1900, of close upon 13,000.

Phidias (*fid'i-as*), the greatest sculptor of ancient Greece, was born about 500 B. C. To Phidias came an opportunity such as comes to few artists. Pericles, having risen to the head of affairs in Athens, resolved to adorn the city with temples and other public buildings, and he therefore not only gave Phidias a commission to execute the more splendid statues that were to be erected, but made him superintendent of all the public works planned for the city. He constructed the Propylæa and the Parthenon, the sculptured ornaments of which were executed under his direct superintendence, while the statue of the goddess of Athena, of ivory and gold, was the work of Phidias himself. He also executed a colossal gold and ivory statue of Zeus for the Olympian temple in Elis; this is considered his masterpiece. In his later years, Phidias was accused of appropriating to himself a portion of the gold designed for the robe of Athena, and of impiety in having placed his own likeness and that of Pericles upon the shield of the goddess, and was thrown into prison, where he died about 430 B. C.

Philadel'phia, the chief city and seaport of Pennsylvania and the third city in population in the United States, is situated on the west bank of the Delaware river at the mouth of the Schuylkill, 135 miles northeast of Washington, and 88 miles southwest of New York. The city is coextensive with the county of Philadelphia, its greatest length being about twenty miles, and its breadth from five to ten miles. Among the most noted buildings are Independence Hall, or old State House, occupied by the Continental congress in 1776; the United States mint and custom-house, the post office, the Masonic temple, which cost over $1,500,000; the Girard college building, the Academy of Fine Arts, the Academy of Natural Sciences, etc. The city hall, begun in 1871 and completed in 1895, is of Massachusetts marble. It covers more than four acres, has 520 rooms, and is the largest city building in the world. The dome and tower, 537½ feet high, is surmounted by

a statue of Penn 36 feet in height. Not far from $20,000,000 have been expended on it. Fairmount park, in which was held the Centennial exposition of 1876, contains nearly 3,000 acres of ground, and is bisected by the Schuylkill river through its entire length of ten miles. In this park is the first established zoological garden in the United States. The Fairmount water-works supply the city with over 100,000,000 gallons of water daily. The public schools of the city, in which there are 3,500 teachers and 150,000 pupils, are maintained at an annual cost of $4,092,855, and besides these, there are over 35,000 pupils taught in Catholic schools. Philadelphia is also the seat of Girard college, and of several other highly-endowed educational institutions, including the University of Pennsylvania, La Salle (Roman Catholic) college, about ten medical and law colleges, and some 40 or 50 hospitals. Philadelphia has become the first manufacturing city in the Union, both in the number of persons employed and in the extent and variety of its productions. An aggregate capital of $400,000,000 is employed in manufacturing, and the value of the productions is $800,000,000 annually, while 250,000 persons are employed. The building of locomotives and the manufacture of iron and steel implements, of carpets and woolens, upholstery goods and cotton goods, employ about 120,000 workmen, and produce $275,000,000 yearly, and there are also several sugar refineries, oil refineries, breweries, and

great chemical works, besides a very considerable foreign commerce.

Philadelphia was founded in 1682 by William Penn, made the capital of Pennsylvania in the following year, and was the central point of the colonies during the war of independence. In Carpenter's Hall, which is still preserved, the first congress met in 1774, and in Independence Hall the Declaration of Independence was signed in 1776. Here the Federal Union was adopted in 1778, and here also the constitution was framed in 1787. Philadelphia was the capital of the Federal Union from 1790 to 1800. Population 1,293,697. See *Philadelphia and Its Environs* (Lippincott).

Philæ (*fīlē*), an island in the Nile, near Assouan and south of Cyrene in Nubia. It is situated near the first cataract, and is a small granite rock, fringed with rich verdure, about 1,200 feet long and 450 broad, almost covered with ancient buildings of great architectural beauty. The Kiosk, Pharaoh's bed, a roofless hall, belongs to the Greek and Roman period, and consists of fourteen great columns with capitals of various patterns, joined together at the lower part by solid walls, 63 feet long and 48 feet wide. The great temple of Isis, to whom the island was sacred, was built by the Ptolemies. It contains representations of the story of Osiris, his birth, bringing up, death, and embalmment by Isis. It was converted into a Christian church in 557.

Phil'ip of Mac'edon, the father of Alexander the Great, was born 382 B. C., and came to the throne 360 B. C., when twenty-two years of age. He was surrounded with many difficulties and dangers, all of which soon disappeared before his decision, energy, and wise policy. In the space of a year, he secured the safety of his kingdom, and was ready to enter upon a policy of aggression, his object being to reduce all the Grecian states to his supremacy. The Greek towns on the coast of Macedonia were the first objects of attack. In Thrace, he captured the small town of Crenides, which, under its new name of Philippi, soon acquired great wealth and fame. After a few years of comparative leisure, he advanced into Thessaly, and ultimately to the strait of Thermopylæ, which he did not attempt to force, as it was strongly guarded by Athenians. After capturing all the towns of Chalcidice, the last of which was the city of Olynthus, he made peace with the Thracians, and the next year with the Athenians. It was during this siege of Olynthus that Demosthenes delivered his famous oration on the crown, in which he sought in vain to arouse his countrymen to a sense of their danger, and cause them to resist the aggressions of the powerful and energetic Macedonian. Philip was now requested by the Thebans to interfere in their behalf in the "Sacred war," which was raging between them and the Phocians. He marched into Phocis, destroyed its cities, and sent many of its inhabitants as colonists to Thrace. In 339 B. C., the Amphictyonic council, composed of several Grecian states, declared war against the Locrians, and the next year appointed Philip commander-in-chief of all their forces. The Athenians were at last alarmed at his approach into Greece in this capacity, and formed a league with the Thebans against him; but their united forces were utterly defeated at the battle of Chæronea, 338 B. C.; and Philip was now master of all Greece. Deputies from the different states met in congress at Corinth, and after resolving to make war on the Persian king, chose Philip as leader of their armies. Philip was busily engaged in preparations for this great enterprise, when he was assassinated by Pausanias, at a festival to celebrate the marriage of his daughter with Alexander of Epirus, 336 B. C., and was succeeded by his son, Alexander the Great. Philip was faithless in the observance of treaty obligations, and utterly unscrupulous as to the means by which he gained his end; but his great ability both as a king and a soldier is conceded by all historians.

Phil'ip, sachem of the Wampanoag tribe of Indians, was the second son of Massasoit, who for nearly thirty years had been the stanch ally of the pilgrim settlers. In 1661, Philip succeeded his elder brother and kept the treaties of his father for several years. But, at length, goaded by the encroachments of the whites, he formed a confederation of tribes, amounting to nearly 10,000 warriors, and in 1675 the war known as "King Philip's war," broke out. The Indians surprised and murdered a great many colonists, but were eventually overcome, and in 1676 Philip himself was captured and slain in Rhode Island. Afterward his body was drawn and quartered and his head was exposed on a gibbet at Plymouth for a number of years. See *Entertaining History of King Philip's War*, and Irving's *Sketch Book*.

Phil'ip II., of France, called Philip Augustus, on account of his great abilities and successful administration, was born August 21, 1165, and died at Nantes, July 14, 1223. He was crowned joint king with his father, Louis VII., in 1179, and on the death of the latter, in the year following, he came into full possession of the kingdom. He was one of the greatest monarchs of the Capet dynasty, while he confirmed his power by marrying Isabella of Hainault, the last direct descendant of the Carlovingians. On the accession of Richard the Lion-hearted to the throne of England, in 1189, Philip and he set out together on the third crusade. After staying three months in the Holy Land, Philip returned home, binding himself by a solemn oath not to molest Richard's dominions; but very soon

after his arrival in France he invaded Normandy, while Richard was a prisoner in Germany. Richard's release from imprisonment and his return to England occasioned a war between the two monarchs, which continued till 1199, when peace was secured through the mediation of Pope Innocent. Richard dying shortly after, war again broke out between France and England on account of the rival claims of King John and his nephew Arthur to Richard's French possessions. Philip espoused Arthur's cause, and after the murder of that prince took possession of Normandy, Maine, Anjou, and Touraine, and added them to his dominions. The great victory of Bouvines, which Philip won, Aug. 29, 1214, over the English and the Emperor Otho of Germany, firmly established his throne, and he was able to devote the remainder of his life to reforms of justice and to building and fortifying the city of Paris.

Phil'ip IV., surnamed *Le Bel*, or "the fair," king of France, was born at Fontainebleau in 1268. He succeeded his father Philip "the rash," in 1285, and by his marriage with Queen Joanna of Navarre he obtained Navarre, Champagne, and Brie. The chief feature of his reign was his contest with Pope Boniface VIII., which grew out of his attempt to levy taxes from the clergy, which the pope directed them not to pay. In 1300, Philip threw the papal legate into prison and summoned the three estates of France — clergy, nobles, and burghers — to which Boniface replied with the bull, *Unam Sanctam*. Philip caused the bull to be publicly burned, and confiscated the property of the prelates who had sided with the pope. Boniface then excommunicated him, but Philip sent William de Nogaret to Rome, who, with the aid of the Colonnas, seized and imprisoned the pope. Though released after a few days by a popular rising, Boniface soon afterward died. In 1305, Philip obtained the elevation of one of his own creatures to the papal chair as Clement V., and seated him at Avignon, which place was the residence of the head of the church for seventy years thereafter. This period of papal history is often called "the seventy years' captivity." Philip compelled the pope to condemn the Templars in 1310, and to decree the abolition of the order two years later. They made a heroic defense, but were condemned and burned by thousands, their wealth being appropriated by the cruel and rapacious Philip. The grand-master, Jacques de Molay, was burned March 18, 1314, and at the stake he is said to have summoned Philip to appear before the judgment seat of Almighty God within a year and a day and the pope within forty days. Whether this summons was actually uttered or not, both the pope and the king died within the periods assigned to them, the latter's death occurring Nov. 29, 1314. Philip strove throughout his reign for the suppression of feudalism and the introduction of the Roman law, but under him the taxes were greatly increased, and the property of the Jews was confiscated in order to satisfy the avarice of the king; and when these means were insufficient to furnish him all the money he desired, he caused the currency to be greatly debased.

Phil'ip VI. (of Valois), king of France, was born in 1293, and became regent of France on the death of Charles IV. in 1328. Philip remained regent during the pregnancy of Charles' widow, but when she was delivered of a daughter, he caused himself to be crowned king at Rheims, the Salic law excluding females from the throne. Philip's right was disputed by Edward III., of England, the grandson of Philip IV., whose mother was the sister of Charles IV. Edward claimed that although his mother could not herself inherit the crown of France, he, as her son, might. In support of this claim, weak as it was, Edward declared war against Philip in the year 1337, which was the beginning of the long wars between England and France, which were brought to a conclusion only by the victories of Joan of Arc, nearly a hundred years later. Edward's first campaign was not attended with any important results, but in 1346, accompanied by his son, known in history as the Black Prince, then but sixteen years old, he marched almost to the gates of Paris, and won a decisive victory over Philip's forces at Crécy. The next year, Calais was taken by Edward, after which a truce was concluded between the two countries, which continued till after Philip's death, which occurred Aug. 22, 1350.

Phil'ip II. (king of Spain), son of Charles V., was born at Valladolid, May 21, 1527. In the year 1543, Philip married Mary of Portugal, who died three years later, after bearing a son, the ill-fated Don Carlos. Eight years after her death, he married Queen Mary of England, who was several years his senior. After remaining in England with her about a year, he returned to Brussels, in the month of September. By the abdication of his father, the next year, Philip became sovereign of Spain, the two Sicilies, the Netherlands, Milan, Naples, Mexico, Peru, and the Spanish possessions in Africa and the East Indies. Philip's marriage with Queen Mary was not a happy one; and after her death, in 1558, he married his third wife, Isabella of France. Philip was an intense bigot in religion, and put himself at the head of the Catholic party in Europe; but the main object of his policy was to concentrate all power in himself, and to suppress everything in the nature of free institutions within his dominions. He found the inquisition a very effective means of tyranny in Spain; but in the Netherlands a formidable revolt was organized, and, under the leadership of William the Silent, the seven provinces formed the union of Utrecht, in 1579, and maintained a successful war against Spain, until their in-

dependence was fully achieved, although William himself was assassinated, at the instigation of Philip, in the year 1584.

After the death of William the Silent, Philip proceeded to organize the "Invincible Armada" for the conquest of England, placing the same under the command of Alexander Farnese, prince of Parma; but his ships were scattered by the storms of the sea, and the valor of English sailors, and only defeat and disaster resulted from all his plans and preparations. The one great triumph of Philip's reign was the naval victory of Lepanto, won by his half-brother, Don John of Austria, over the Turks.

The desperate heroism of the Netherlanders and the defeat of the Armada, added to financial distress at home, embittered the last years of Philip, and he died of a lingering and loathsome disease at the Escurial, Madrid, Sept. 13, 1598, being succeeded by Philip III., his son by his fourth wife, the Archduchess Anne of Austria.

Philip possessed considerable ability, but little political wisdom, and although he undertook a great many vast enterprises, scarcely any of them led to a profitable result. He was cold and austere without being virtuous, and although a bigot and a persecutor, he had no real respect for honor or religion. There is hardly a character in history whom historians have more unanimously united in condemning. See the histories of Prescott, Motley, and Froude.

Phil'ip V., the first Bourbon king of Spain, was born at Versailles, Dec. 19, 1683, his father being the Dauphin Louis, son of Louis XIV. of France. In the year 1700, the crown of Spain was bequeathed to him by Charles II. He entered Madrid in 1701, and after a long struggle with his rival, the Archduke Charles, was left in possession of his throne by the peace of Utrecht in 1713. His queen, Maria Louisa, dying in the next year, Philip soon after married Elizabeth Farnese, of Parma, "the termagant," to use Carlyle's phrase, who disturbed the peace of Europe for thirty years. Her dearest wish was to drive the Hapsburgs out of Italy in the interests of her sons by a former marriage; but all her efforts resulted only in securing the two Sicilies for Don Carlos. Spain joined the coalition against Maria Theresa; and her younger son, Don Philip, was at first successful in conquering the Milanese; but as soon as the Silesian war was closed by the peace of Dresden, the Austrian queen sent her troops into Italy and drove out the Spaniards. At this crisis Philip, who had been in a state of mental stupor for several years, died at Madrid, July 9, 1746.

Phil'ip, John Woodward, an American naval officer, was born at New York city, Aug. 26, 1840. In 1861, he graduated from the naval academy, and served as midshipman on board various vessels blockading the Gulf harbors and also in the James river fleet. He became a lieutenant in 1862, and lieutenant-commander in 1866; commander in 1874; captain in 1889, and commodore in 1898. He was wounded at Stone river during the Civil war. During the years of peace he made a tour of the world in command of the Woodruff Scientific expedition (1877). He was in command of the battleship *Texas* during the fight off Santiago bay, in the Spanish-American war; and his request of his men not to cheer over their dying foes excited widespread comment. He was a very earnest Christian soldier, and led his sailors and marines in prayer at the close of the fight above mentioned. He was for a time in command of the North Pacific squadron, and later assigned to the command of the navy-yard at Brooklyn, where he died, with the rank of rear-admiral, June 30, 1900.

Phil'ip the Bold, son of John the Good, of France, and founder of the second and last ducal house of Burgundy, was born Jan. 15, 1342. He was present at the battle of Poitiers, in 1356, when only fourteen years of age, and displayed such heroic courage in risking his own life to save his father's, that he earned the title of Le Hardi, or "the Bold." He shared his father's captivity in England, and on his return to France, in 1360, received as the reward of his bravery the duchy of Touraine, and in 1563 also the duchy of Burgundy. Flanders, Artois, Rethel, Nevers, and the county of Burgundy fell to him by the death of his father-in-law, the count of Flanders, in 1384, and his firm and wise government quickly won him the esteem and affection of his subjects. He encouraged arts, manufactures, and commerce, and his territory was one of the best governed in Europe. During the minority and imbecility of his nephew, Charles VI. of France, he acted as regent of that kingdom, and displayed great wisdom and ability both in preventing insurrection within the state and in defending it against the attacks of the English. He died April 27, 1404.

Phil'ip the Good, son of John the Fearless, and grandson of Philip the Bold, was born at Dijon, the capital of Burgundy, June 13, 1396. In order to avenge the death of his father, who had been assassinated at the bridge of Montereau, at the instigation of the dauphin (afterward Charles VII.), when he succeeded to the duchy of Burgundy, he entered into an alliance with Henry V. of England, recognizing him as the rightful regent of France and heir to the throne after Charles VI.'s death. This agreement, although it disregarded the terms of the Salic law, was sanctioned by the king and the states-general of France in the treaty of Noyes in 1420; but the dauphin refused to accept it and took up arms. He was, however, defeated at Crévant and at Verneuil, and driven beyond the Loire. Some time

after this, on account of some insults of the English viceroy, Philip made a final peace with Charles, who gladly accepted the hard conditions prescribed by Philip. The English in revenge committed great havoc among the merchant navies of Flanders, which so irritated Philip that he declared war against them, and with the assistance of the king of France, gradually expelled them from their French possessions. Under Philip, Burgundy was the most prosperous and tranquil state in Europe; and in spite of several insurrections in Ghent and in Bruges, caused by the imposition of heavy taxes, he was greatly beloved by his people. He died at Bruges, July 15, 1467. See Barante's *History of the Dukes of Burgundy and the House of Valois.*

Philippine Islands, The, a group of islands in the Pacific ocean lying southeast of Hong-Kong, China, which were discovered by Magellan in 1521. He was slain a few months later upon one of the smaller islands during the progress of one of the numerous tribal wars. Spain attempted to make good her claim to these lands a few years afterward by sending out an expedition under Villabos who named the islands in honor of the heir to the Spanish throne, afterward Philip II. The first attempts at settlement were made upon Zebu; but in 1581 Manila was founded, and it has since continued to be the chief city of the archipelago. The exact number of the islands is unknown, but it is sometimes given as "more than 1,200." Most of the islands, however, are small, and many of them uninhabitable. The largest islands are nine in number, and they are called Luzon, Mindanao, Samar, Mindoro, Panay, Leyte, Masbate, and Cebu. The total area of the habitable islands is supposed to be about 114,326 square miles. The population is also a matter of uncertainty, but is given as between 5,985,000 and 7,000,000. Some estimates are even higher; but as they are all more or less guesswork they are of little value. The census of those lately under Spanish rule is somewhat less than 6,000,000. The islands are exceedingly fertile, and their mountains are clothed with forests of inestimable value. The one chief product of the islands is hemp; sugar, coffee, cocoanuts, tobacco, and indigo following in the order named. Coal to the amount of 60,000 tons a year has been mined in Cebu, and gold-mining has at times promised important developments. The chief imports of the islands are cotton goods, silks, drugs, and chemicals. The total value of exports in 1894 was $33,149,984, and the imports the same year reached $28,529,777. Both exports and imports fell off the next year; and during the insurrection which broke out in 1896 business was greatly depressed. In January, 1898, peace was agreed upon by a compact between the Spanish authorities and Aguinaldo, leader of the Filipinos, the terms of which do not appear to have been kept by either party. In April, 1898, war broke out between Spain and the United States, the first serious encounter being the battle of Manila Bay, May 1, 1898, when the Spanish squadron under Admiral Montojo was completely destroyed. At the close of this war, Spain (by treaty Dec. 10, 1898) ceded the Philippines to the United States, $20,000,000 being paid to Spain. Meantime, Aguinaldo proclaimed the Philippines an independent republic and thus brought on a conflict between his followers and the United States, which was terminated only by his capture in April, 1901. On July 4, 1901, military was superseded by civil government, under Wm. H. Taft, of Ohio, who was appointed civil governor of the islands. Manila, with a population of 154,000, upon the island of Luzon, is the seat of the government constituted by the authority of congress under the personal direction of the President of the United States. See AGUINALDO, and SPANISH-AMERICAN WAR. See also Dean C. Worcester's *The Philippine Islands.*

Philippopolis (*fil-ip-op'ō-lis*), capital of eastern Rumelia or southern Bulgaria, on the navigable Maritza, 110 miles from Adrianople. It manufactures silk, cotton, tobacco, leather, etc. Population 41,068, of whom one-half are Bulgarians, the remainder being Turks, Greeks, etc. Philippopolis was occupied by the Russians in 1878, and in 1885 a revolution broke out here which led to the incorporation of eastern Rumelia with Bulgaria.

Philistines (*fil-is'tinz*) ("strangers"), a people mentioned in the Bible as being in frequent conflict with the Jews, and who lived on the coast of the Mediterranean to the southwest of Judæa. Their first appearance as the enemies of Israel was during the period of the Judges. They were subject to five princes who ruled over the cities or provinces of Gaza, Ashdod, Askalon, Gath, and Ekron. In the time of Eli they were so powerful that they even carried away the ark. Saul, the first king of Israel, was engaged in frequent conflicts with them, and both he and his sons fell in a disastrous battle against them at Gilboa. David won a great many victories over them, and under Solomon most of their territory was annexed to that of the Jews, and they continued in subjection to the kings of Judah until the reign of Ahaz, three hundred years later, when they revolted and made great havoc in the territory of Judah. Hezekiah, the son and successor of Ahaz, however, subdued them and brought them to obedience, without the aid of the Egyptians. Under the later kings of Judah they appear, from the menaces of the prophets, to have brought many calamities on the Jews — if they did not recover their full independence. In the time of the Maccabees the Philistines were Syrian subjects, and in the time of Herod the Great they appear no longer to have an existence as a separate race or nation,

even the name of their country being merged in that of Palestine.

Phil'lips, Wen'dell, the distinguished orator and abolitionist, was born of wealthy and aristocratic parentage at Boston, Mass., Nov. 29, 1811. After taking a course of several years' study in the public Latin school of his native city, he entered Harvard college, from which he graduated in 1831, at the age of twenty. While yet in his collegiate course Phillips was noted not only for his superior scholarship, but for his oratorical gifts and the marked purity and dignity of his character. Strange to say, however, this young man who afterward became the special champion of the slave in the face of the civilized world was at this time a representative aristocrat. In 1834, having taken a three years' course of legal study, Mr. Phillips was admitted to the bar at Boston, but his silvery voice was not to be confined within the court rooms of that city — a nation was waiting to be thrilled and electrified by his eloquent speech. A little more than a year after entering upon the practice of his profession he witnessed the mobbing of William Lloyd Garrison at Boston, which made a deep and lasting impression upon his mind and awoke him to serious thought upon the evils of slavery. Two or three years later, the young lawyer attended a meeting of an anti-slavery convention at Lynn, where he delivered an eloquent address, in which he avowed himself an abolitionist. But it was in Faneuil hall, in the latter part of the same year, that Mr. Phillips, then only twenty-six years old, delivered the first of those marvelous philippics that did so much to arouse the anti-slavery sentiment of the nation, the occasion being a meeting called to denounce the murder of E. P. Lovejoy at Alton, Ill., for advocating anti-slavery sentiments in his paper published at that place. One of Mr. Phillips' auditors on that occasion says of his address: "I had heard him once before (in his first anti-slavery speech at Lynn), as a few others in that great meeting probably had, and my expectations were high; but he transcended them all and took the audience by storm. Never before, I venture to say, did the walls of the old 'Cradle of Liberty' echo to a finer strain of eloquence." From that time on Mr. Phillips continued the faithful and unflinching opponent of slavery, raising his voice against it throughout the land and devoting his gifts and varied powers to the single purpose of its abolition and destruction. But although the very prince of agitators, he himself was always calm and unperturbed. Sooner, no doubt, than he ever anticipated was the fruition of his hopes fully realized, in the Emancipation Proclamation of President Lincoln.

Although the matter of Mr. Phillips' speeches was nearly always fiery and impassioned, his delivery as well as his manner on the platform was invariably calm, reserved, perfectly easy, and natural, giving him a power over his audiences that compelled their interest and attention, even when they most disagreed with him. Very appropriately was he called "the unagitated agitator." He died at Boston, Feb. 2, 1884.

Phillips'burg, N. J., a city of Warren county, on the Delaware river, opposite Easton, Pa., where the river is crossed by two iron bridges. It is situated in a fine agricultural, limestone, and iron-ore region. Besides extensive iron works, a rolling mill, boiler and machine works, and a reaper and mower factory, there is a silk mill and several other industries. There are good schools in the town. Population 10,052.

Phi'lo Judæ'us, the distinguished Jewish philosopher of the 1st century, was born at Alexandria about 20–10 B. C. Belonging to a wealthy family, he received a liberal education, and such was his zeal for learning that he had passed through the ordinary course of Greek studies at a very early age. But he considered philosophy the mistress of all sciences, and he tells us that metaphysical speculation was the only thing that could give him complete pleasure and satisfaction. He was acquainted with Homer, Plato, and the Greek tragedians; but with all his Greek culture he remained a Jew, holding Jewish philosophy as the highest wisdom and the divine revelation given to Moses as the source of all true religion. Of his life little is known, except that he made one visit to Jerusalem, and that when over fifty years of age he went to Rome as the advocate of his Jewish brethren in Alexandria, who refused to worship the emperor Caligula.

To Philo the divinity of the Jewish law is the basis and test of all true philosophy, and although he admits that some portions of the Jewish scriptures may be interpreted in an allegorical sense, he yet insists that in general their literal meaning is the one that must be accepted. At the same time he frequently presents the allegorical meaning as the one really divine, and sometimes, without expressly denying the literal meaning, treats it as absurd. While thus cherishing philosophy, he held fast to his reverence for the law, and nearly all his writings were an effort to harmonize the two. In a word, he sought to be a disciple of both — a Greek, with all the refinement of Greek culture, and at the same time a pious and faithful Jew. According to Philo, God alone is the real Good, the perfect and final cause of all things, which ceaselessly flow outward from Himself. He is the primeval light, which cannot be seen by itself, but which may be known from its rays that fill the whole world.

Philo holds firmly to the belief in immortality; but future rewards and punishments are not regarded by him in the ordinary sense of those terms. Virtue and sin have their rewards within themselves; but the soul, which is "pre-existing," carries this con-

sciousness with it in a more intense and exalted manner. Paradise is oneness with God; there is no hell for souls without a body, and no devil in Philo's system. See *Philo-Judæus*, by Drummond.

Philoctetes (*fil-ok-tē'tēz*), a famous archer, the friend and armor-bearer of Hercules, who bequeathed him his bow and poisoned arrows. As one of the suitors of Helen, he led seven ships against Troy; but being bitten in the foot by a snake, or, according to one account, wounded by his own arrows, as his wound gave forth an unendurable stench, the Greeks left him on the island of Lemnos, where he remained ten years. But an oracle declaring that Troy could not be taken without the aid of Philoctetes, Ulysses and Neoptolemus were sent to Lemnos to bring him to the Grecian camp, where, healed by Æsculapius or his sons, he slew Paris and otherwise assisted in the capture of Troy.

Philology (*fi-lol'ō-gy*). This word is derived from two Greek words, *philos*, "a friend," and *logos*, "a word"; and like many other words it has varied greatly in its meaning. In the time of Plato it meant the love of discussion, confined mainly to the moral and social question in which Plato delighted; and the method of discussion was the Socratic one by asking questions. At Alexandria, the "philologer" gave attention to all the knowledge of his day, brought together for the first time in the great library in that city; but the scholars of Alexandria applied themselves especially to the study of the older Greek literature. It widened again at the revival of learning to include the study of grammar, rhetoric, literature, poetry, archæology — in a word, all the "humane" studies. Since the middle of the 19th century, the word has been used in a more restricted sense; so that, whereas philology formerly meant the study of the literature of the world, it is now limited to the study of languages, apart from the literature embodied in them. It is the science which deals with the origin, development, and general structure of the different languages of the world and of human language as a whole. In the progress of this study not only has great light been thrown on the origin of different languages; but they have been classified and grouped, and in many cases languages which seemed to have no points of similarity have been traced to a common origin. Sir William Jones, the great oriental linguist, declared that "no philologer could examine the Sanskrit, Greek, and Latin without believing them to have sprung from the same source, which, perhaps, no longer exists. There is a similar reason, though not quite so forcible, for believing that both the Gothic and the Celtic had the same origin with the Sanskrit." There are two main classes of languages: First, those which show no signs of inflection — for example, in which the plural of man is not formed by a vowel change (as our men), nor by an added suffix (as in Latin homin-*es*), but by a combination of two words (as our man-kind); second, those which are inflected in greater or less degree. This latter class is divided into two great families: (1) the Semitic, comprising the Hebrew, Aramaic, Arabic, Syriac, etc.; (2) the Indo-Germanic or Aryan family, the chief languages of which are the Sanskrit, the Armenian, the Albanian, the Latin, the Celtic, the Teutonic or Germanic, the Slavonic, etc. See Isaac Taylor's *Origin of the Aryans*.

Philos'ophy (Greek *philos*, "a friend," and *sophia*, "wisdom"). A complete and final definition of this word is impossible, as the objects of the science, its methods, and even the possibility of its being or becoming a science, are still matters of debate between different schools. Philosophy has been called the "mother of the sciences," as it was only by slow degrees that the separate sciences came into life, each one of them being developed and formulated by men imbued with the philosophical spirit, which is the "love of wisdom." As the number of special sciences increased, philosophy could no longer in a strict sense "take all knowledge to be her province"; but her claim to be the only science of the universe as a whole was not thereby given up, but rather emphasized. Unity and harmony in one conception of the universe is th aim which philosophy always has in view. Whether this idcal can ever be reached by man is another question; but the conception of a complete system of things satisfactory to the reason and the moral sense must ever be the spring and inspiration of philosophical effort. The philosopher, therefore, always has his eye upon the whole, and his function is to study the relation of all the parts to the whole and to one another. No one thing can be fully understood except in the light of its relation to other things, and therefore the philosopher seeks to penetrate the reason and essence of things and to know the *why* and the *wherefore* of all the phenomena of nature. The history of philosophy is an important part of philosophical study. Indeed, philosophy cannot be studied with profit apart from its history.

Thales of Miletus is generally reckoned the first Grecian philosopher, and the history of philosophy is generally said to commence at his time, about 600 years B. C. It is usual to divide the history of philosophy into three distinct periods: (1) Ancient or Greek philosophy, from the time of Thales to about 500 A. D.; (2) mediæval philosophy, from 500 to 1600 A. D.; (3) modern philosophy, from 1600 to the present era. Ancient philosophy is again divided into three periods: (1) The pre-Socratic philosophers — Pythagoras, Parmenides, Anaxagoras, and others — who devoted their attention mainly to the phenomena of external things; (2) Socrates and the sophists who turned man's attention upon himself; (3) the idealistic systems of Plato

and Aristotle. The Stoics, Epicureans, Sceptics, and later the Neo-Platonists and other schools, make up the history of philosophy until the downfall of the Roman empire and the death of Bœthius. Mediæval philosophy is mainly an effort to apply the logic of Aristotle to the doctrines of the church and to harmonize his philosophy with Christian theology. Bacon and Descartes, in the beginning of the 17th century, may be considered the founders of modern philosophy, to give an adequate history of which would require volumes. See English translations of histories by Erdmann, Ueberweg, and Schwegler.

Phloem (*flō'ĕm*), (in plants). A woody strand is known as a vascular bundle, because it contains different forms of the cells known as vessels. Each individual vascular bundle consists of two elements, the wood and the bast. The bast elements of a vascular bundle taken together are called the "phloem," in contrast with the wood elements, which are called the "xylem." In an ordinary tree it is the xylem tissue which accumulates as the permanent wood, while the phloem tissue forms the fibrous lining of the bark. In the stems of Monocotyledons, as the cornstalk, the vascular bundles are scattered, and no bark is formed, but each bundle is composed of phloem on its outer side and xylem on its inner side. In the vascular bundles of the stems of most ferns the phloem completely surrounds the xylem; while in all roots the phloem and xylem occur in alternate strands about the center. The phloem is concern in the transfer of foods.

Phlox (*flŏks*), a genus of the *Polemonium* family containing about 30 species, which are natives of North America and northern Asia, nearly all of the species being found in North America. They are mostly hardy herbs with usually showy red, violet, or white flowers. The perennial species are among the most popular of garden plants. Perhaps one of the best-known phloxes of cultivation is *P. drummondii*, occurring throughout Texas and cultivated everywhere. *P. subulata* and its varieties are the best known of the dwarf creeping kinds, and are frequently called "ground" or "moss pinks." *P. maculata*, the wild Sweet William, is probably the best known and widely distributed of the wild forms.

PHLOX.

Phocion (*fō'shi-on*), an Athenian general, was born about the end of the 5th century B. C. Although of humble origin, he studied under Plato, and perhaps under Diogenes also. In 341 B. C., Phocion was successful in overcoming the Macedonian party in Eubœa and in restoring the ascendency of Athens, and the next year, being sent to the relief of Byzantium, he forced Philip to abandon the siege of that city and to evacuate the Chersonesus. A little later, however, he placed himself in opposition to Demosthenes and others who advocated resistance to Philip's demands, and after the assassination of Philip, in 336 B. C., we find him striving to repress the desire for war among the Athenians, on account of which many regarded him as a traitor; but this charge was doubtless unjust. On the death of Alexander the Great, Phocion endeavored in vain to hinder the Athenians from going to war with Antipater. After the death of Antipater he was involved in the intrigues of Cassander, and was forced to flee to Phocis, where he was delivered up to the Athenians and condemned to drink hemlock (317 B. C.). His body was carried by some of his friends to Eleusis and there burned.

Phœ'be, a small fly-catcher nesting about houses and other structures. Its nest of moss and mud may be placed under bridges, in barns, sheds, the shelter of piazzas and other similar situations. It is about seven inches long, dark above and white below, tinged with yellow. Its bill is black. It is sometimes called pewee, but that name is better reserved for the wood-pewee. It winters north of the frost-line. It owes its name to its song of *pewit-phœbe*. See PEWEE.

Phœ'bus ("the bright"), an epithet and afterward a name of Apollo. It had reference to the youthful beauty of the god and to the radiance of the sun, when, at a later period, Apollo became identified with Helios, the sun-god.

Phœnicia (*fē-nĭsh'i-a*), the name of a certain territory lying on the east coast of the Mediterranean, north of Judea. The boundary lines of Phœnicia differed at different times, but its length was generally about 200 miles and its average width about 20 miles. It is impossible to say when the first Phœnician settlers entered the country; but it is generally conceded that they did not come from one region, but from several different directions, and they grew into one nationality very slowly. The history of Phœnicia covers nearly 2,000 years; and although our sources of information are very meager, it may be divided into four distinct periods. The first of these comprise the immigration and gradual development of the various tribes until the historical time when Sidon began to take the lead, about 1,500 B. C. The second period dates from the conquest of Palestine by the Hebrews, when Sidon had already become

the "first born of Canaan," as recorded in Genesis. The flourishing state of its commerce and manufactures is also seen from many passages in Homer. The gradual ascendency of the rival city of Tyre marks the beginning of the third period, in which Phœnicia attained her greatest power and glory, her ships covering every sea, and her commerce extending far and wide among other nations. During the reigns of David and Solomon (980–917 B. C.) very friendly relations existed between the Israelites and the Phœnicians under Hiram, king of Tyre. As each country needed what the other could supply, a very close alliance was formed, between Hiram and Solomon especially, Hiram furnishing a portion of the material for Solomon's temple at Jerusalem. By this time, too, the Phœnicians had not only planted colonies on the coasts and islands of the Ægean and Mediterranean seas, but had passed through the Strait of Gibraltar, and established themselves on the western coast of Spain and of Africa, while at the same time their alliance with the Hebrews permitted them to find their way to the Indies by the Red sea. Although at first they traded in the wares of Egypt and Assyria, they soon became manufacturers on a very extensive scale, and drew the whole world into the circle of their commerce. The two chief articles of their manufacture were glass and the purple dye obtained from a shellfish of the Mediterranean. Purple was one of the most noted luxuries of ancient times — especially in Asia. In temples and palaces for gods and men purple garments, hangings, curtains, and veils were used very extensively; and Alexander the Great found in Susa alone a store of purple worth 5,000 talents. Sidon's principal production was glass — invented there by accident, it was said; but most probably the invention came from Egypt. The mining operations of the Phœnicians were very extensive at this time; and they well understood how to work the metals thus obtained. The description of the mining process in Job xxviii. 1–11, must have been derived from a sight of the Phœnician mining works. The art of pounding brass had certainly reached a high degree of perfection to enable Hiram to execute such works for Solomon's temple as are described in the Bible. Hiram's reign seems to have been the beginning of the end of Phœnicia's prosperity and glory. He was succeeded by his son Baleastartus, who died after a reign of seven years, and a long series of political calamities and civil wars then ensued. The fourth and last period of Phœnician history may be dated from the middle of the 8th century B. C., when Shalmaneser, king of Assyria, besieged Tyre for five years without being able to take it. Peace was concluded on terms that were very favorable to Tyre; but two centuries later Phœnicia was conqured by Assyria. She was afterward conquered by Nebuchadnezzar, and remained subject to Babylon until the capture of that city by Cyrus the Great, when she became a part of the Medo-Persian empire; and when Persia was conquered by Alexander the Great, the last shadow of Phœnicia's independence passed away. Since 65 B. C., the Phœnician territory has been a part of Syria. The religion of the Phœnicians was like that of all ancient Semitic religions — except that of the Hebrews — a kind of Pantheistic worship of nature, their two principal deities being Baal and Astarte. See *History of Phœnicia*, by Rawlinson.

Phœ'nix, the name of a mythical Egyptian bird, which is said to have burned itself, when a new Phœnix arose out of its ashes.

Phonet'ics, the science of the sounds of the human voice. Sound is produced by the expulsion of air from the lungs through the windpipe, and when this air in its passage through the throat sets the vocal cords in vibration, what we call "voice" is produced. After passing through the throat the voice enters the mouth, or nose, or both of these. As a practical science, phonetics comprehends not only a knowledge of the various sounds uttered in human speech, but also the invention or discovery of an alphabetical symbol to represent each of them. The sounds of the voice are of two kinds — "fixed sounds," where the cavities of the mouth remain unchanged during the passage of the air, and "glides," where these cavities are constantly changing, or, in other words, where the utterance is variously modified by the tongue, palate, lips, and teeth. The former of these are called *vowels*, and in the English language are represented by the letters, *a, e, i, o, u, y;* the latter are called consonants-with-sounders, as they are sounded with the vowels, but not alone. The great variations in spelling and pronunciation in the English tongue have long been a source of perplexity to foreigners learning our language, and have caused many "phonetic reformers" to arise, with plans for producing uniformity; but none of these have ever been adopted, except in the case of a few words. Perhaps the reason of this is that however "irregular" may be the spelling of so many words, yet the forms in which they are written have become as firmly fixed in our mental habit as are the sounds they represent and the ideas conveyed by those sounds; hence we can never consent to any changes, except those that are gradual, and proceed as by a process of evolution. Another difficulty in reference to the phonetic reform would be, that even if it were possible to devise a fixed alphabetical symbol for every sound or combination of sounds, to which all good writers would conform, the pronunciation of words would at once begin to vary, and in the course of time our spelling and pronunciation might be as "irregular" as they now are.

Pho'nograph, an instrument invented by Edison in 1877, for the purpose of recording

and reproducing words spoken by the human voice. Leon Scott had already shown that, by speaking in front of a diaphragm, on the rear side of which was fixed a stylus, he could obtain a graphical record of the human voice on a cylinder rotating behind the diaphragm. The step which Edison made was to introduce a wax cylinder and a needle-point attached to the diaphragm. On rotating the wax cylinder, the needle-point cuts a groove. And if while this groove is being cut one "talks to the diaphragm" the indentations of the needle-point in the wax will vary with each pulsation of the voice. The axis of the cylinder is provided with a screw so that the groove takes the form of a spiral as the cylinder is rotated and translated while the stylus is fixed in one position. A record having been impressed upon the wax, it is only necessary to allow the stylus again to trace the groove in order to impress upon the diaphragm exactly—or nearly exactly—the same vibrations which originally produced the groove. In this way, the phonograph is made to repeat whatever is said to it. A new phonographic principle has recently (1900) been invented by a Danish engineer, Poulsen, and was exhibited practically for the first time at the Paris Exposition. Poulsen uses the current in a telephone circuit to magnetize a strip of steel tape which is drawn continuously between the poles of an electro-magnet—the electro-magnet being energized by the telephone current. The record of anything spoken into the telephone is thus stored up in the magnetization of the steel tape. Accordingly, when the steel tape is again drawn between the poles of the electro-magnet, the telephone in the circuit will repeat, owing to currents induced by the steel tape, whatever was originally spoken to it. Still a third phonographic principle has recently (1901) been devised by Nerust; but has not yet been perfected. It is based upon the electrolysis produced by an electric current.

Phonog'raphy. See SHORTHAND.

Phonom'eter is the name given by Thomas Edison to an instrument of his own invention for testing the force of the human voice in speaking. It consists chiefly of a mouthpiece and diaphragm, behind the latter of which is placed a delicate mechanism which operates a 15-inch fly-wheel by means of which a hole can be bored in an ordinary pine board.

Phonophore (*fō'no-fōr*), **The,** is a device of Mr. Langdon Davies of London, England, for transmitting electric signals through circuits which are not closed. Messages have been sent over wires open at both ends, under circumstances which would render ordinary telegraphing impossible. The same wire has been used at once for ordinary telegraphing and for the transmission of phonophore signals. When, the resistance having been greatly increased, the ordinary signals ceased, those of the phonophore continued as distinct as before. The transmitter is fitted with a vibrating reed at one end, and the receiver with a stretched steel band at the other, which can be tuned to the same note.

Phosphorescence (*fŏs'fŏr-ĕs'sens*). When a body emits light because it has been raised to a high temperature, we describe the phenomenon by the name *incandescence;* but when a body emits light without being raised to a correspondingly high temperature, the process is called *luminescence.* A piece of sugar cut in the dark will emit a faint light; this is an example of luminescence. A solution of sulphate of quinine held in ultra-violet light will emit a faint blue light; this is another example of luminescence, which is generally known as *fluorescence.* The Germans call it *photo-luminescence,* because it is an effect produced by light. Red ink, when made of eosin, behaves in the same way as quinine. But as soon as the illumination ceases, these bodies cease to give off their fluorescent light. There are certain other bodies, however, such as sulphides of barium, calcium, and strontium which continue to exhibit fluorescence even after illumination has ceased. This phenomenon of persistent fluorescence is called *phosphorescence.* Becquerel has proved that most bodies exhibit phosphorescence, but only for a very short time after illumination. The student should carefully note that the glow exhibited by phosphorous in the dark is due to slow oxidation, and is not a case of phosphorescence at all. Properly classified, it is a case of *chemical* luminescence.

Phos'phorus, one of the non-metallic elements. At ordinary temperatures it is an almost colorless, or faintly yellow, solid substance, having the glistening appearance and consistence of wax. If it be heated to 140° F. in the air, it catches fire and burns with a brilliant white flame. It is so inflammable as to burn by mere friction at ordinary temperatures. Even the warmth of the hand may set it to burning. Hence, in experiments, care must be taken lest the hands be severely burned. It is kept in water lest it may spontaneously get on fire. It shines in the dark, from the slow combustion, which it undergoes. Taken internally, it is a powerful irritant poison. Persons engaged in the manufacture of matches are frequently seriously affected by its fumes. Scientists have overcome this danger to some extent by the discovery of red phosphorus, which is prepared from the ordinary phosphorus by heating it in a closed iron vessel. Phosphorus is not found in an uncombined state in nature. It was first discovered by Brandt, in 1669. Bones at present furnish a large part of the phosphorus of commerce. Bones are burned to whiteness and powdered, then mixed with sulphuric acid to decompose the phosphate of lime in the ash; the solution of the superphosphate is

evaporated to a syrup, mixed with charcoal and then distilled, when the phosphorus rises in vapor and is condensed. The mineral apatite is also used instead of bones.

Photius (*fō'shi-us*), a patriarch at Constantinople, whose chief distinction is his influence in bringing about the separation between the Latin and the Greek churches. The separation did not completely take place during his time, but its beginning did. Steps were taken under his leadership which could not be retraced. Ignatius tried to correct the vices of Michael III., Byzantine emperor (842–867). For this he was deposed and banished, and Photius, although a layman, was appointed in his stead, and was hurried through all the successive stages of sacred orders, and installed as patriarch. His election was confirmed by two successive councils. The pope reinstated Ignatius, and excommunicated Photius, but the emperor, sustaining Photius, he retained possession, and retaliated on the pope by calling a new council. This council in 867 A. D. raised a controversy of doctrine and discipline between the churches of the east and west. The east withdrew from the west. The Emperor Michael being put to death, Photius was banished to Cyprus, and Ignatius was reinstated. The controversy went on, Photius was recalled, and he summoned a council which condemned the western church. Some time after this the separation was completed. He died about 891 A. D.

Pho'to-Engrav'ing is a process for the conversion of a photograph into an engraving, from which engraving prints may be taken by any good printing press. Such perfection has been reached in this art that photo-engravings have largely replaced wood-engravings for the purposes of book and newspaper illustration. One of the best, if not most of the processes in use to-day, will be found based upon discoveries made in the early part of the nineteenth century, that asphaltum, when it has been subjected to the action of light, is no longer soluble in its ordinary solvents. A plate therefore coated with asphaltum which has been exposed in the camera obscura to light and shade would possess a surface, part of which was soluble and part insoluble. By the application of biting acids, these plates are then chemically etched. This process is especially useful to reproduce line engravings or the pen-and-ink sketches used so freely in the daily papers and which are now rapidly produced by chemical processes. Many of the variations in the ordinary process are kept secret, and others could hardly be explained to any other than an expert.

Photog'raphy. The art of making pictures by the direct action of light on a sensitive surface dates from the beginning of the last century. The action of light on certain salts of silver was studied by Scheele, a Swedish chemist, in 1777, who laid the foundation for the work which followed. He found that certain of the salts were blackened by exposure to light, the effect being due largely to the blue and violet rays in the spectrum. It was an easy step to coat paper with this sensitive substance, and obtain impressions of leaves, ferns, and similar objects by the action of sunlight, but no way was known of rendering the pictures permanent, and they attracted no great amount of attention. In 1839, a Frenchman named Daguerre succeeded in producing a sensitive surface on a copper plate which was so rapidly affected by light that impressions could be made on it in the camera, which impressions could be made permanent. The process at once met with great favor, and, owing to its comparative cheapness, almost immediately supplanted miniature painting, which was then in vogue. The disadvantages of Daguerre's process were manifold. Very long exposures were required, a sitting was required for each picture, and the pictures had to be held in a certain light to be seen.

The next step was the invention of the collodion plate, which shortened the time of exposure, and furnished the means of producing any number of pictures from a single plate. It was necessary to use these plates in a wet condition, however, and their employment was consequently limited to the studio. The discovery of the dry plate, which is in use at the present time, was made about a quarter of a century ago, and was the means of bringing the art within the reach of everybody. Before the days of dry plates the photographer was obliged to carry about with him a portable dark room, for the plates had to be immersed in a bath of silver nitrate immediately before exposure, and the development could not be postponed a moment after exposure.

The present dry-plate process is essentially as follows. Glass plates are coated with a film of gelatine containing a mixture of bromide and iodide of silver. After exposure in the camera they are developed by means of suitable chemicals in a room illuminated only with red light. The action of the light on the plate is to start a reaction in the silver salt which requires the action of the developer to complete it. This reaction is the transformation of the white bromide of silver into black metallic silver. The plate after development consequently appears black wherever the light has acted on it, the resulting picture being called a negative, since the high lights are black, and the deep shadows white. After development the plate is transferred to a bath of hyposulphite of soda, which dissolves the unaffected silver salts leaving the gelatine quite transparent except for the black deposit which forms the picture. From this negative any number of pictures can be printed by exposing sheets of sensitized paper under it to the action of sunlight. The black deposit of sil-

ver in the film screens the paper from the blackening action of the light; consequently the resulting print is white in those places which, in the negative, are dark, and the picture is a positive. Modern plates are made so sensitive that it is possible to secure pictures of objects in sunlight in the $\frac{1}{1000}$ part of a second. The plates of Daguerre required an exposure of from five to fifteen minutes.

Since the introduction of these extremely sensitive plates photography has proved of the greatest aid in scientific investigations. In astronomy clusters of stars and nebulæ have been photographed, which no eye can see, even in the most powerful telescopes, for the photographic plate can be exposed for hours to the image, the action of the feeble light accumulating in the sensitive film, whereas in the eye, if the light is too feeble at once to affect the retina, prolonged gazing is wholly without effect.

By employing the light of the electric spark, rapidly moving objects can be photographed in as brief an interval as the millionth part of a second. In this way beautiful pictures of flying rifle balls, with the ripples and waves of air which accompany them, and the boiling wake which follows them, have been secured by Professor Boys of London. Professor Wood, of the University of Wisconsin, had secured in a similar manner pictures of sound waves in air, the image of the spherical wave of condensed air being impressed on the photographic plate by the light of an electric spark occurring at just the right moment. By means of cameras fitted with electric lights, which have been lowered into the sea, pictures of the ocean's bottom, with the sea plants and coral formations, have been taken. Swung from the tails of kites, cameras, operated by an electric current sent up the wire kite string, give us pictures of our surroundings as they appear from an elevation of a mile or two.

Book and magazine illustration is now done largely by photography, the old-fashioned woodcut having been driven out by the zinc plate, which is engraved or etched by a photographic process, giving an absolute fac-simile of the original drawing. One of the most remarkable developments within the last ten years has been the production of plates which are sensitive to all the colors of the spectrum. The ordinary commercial plates are sensitive only to the blue and violet parts of the spectrum, consequently red or yellow objects always come out black in the finished picture. Vogel, of Berlin, discovered, however, that if the plates were slightly stained with some aniline dye capable of absorbing the red and yellow light, they at once became sensitive to these colors, consequently such plates could be used for photographing colored objects, where it was essential that correct color values should be rendered. Plates are now made which will blacken in the light of the ordinary dark-room red lamp, almost as quickly as ordinary plates in candle light. Such plates are called arthochromatic plates, and they are used for photographing paintings and other colored objects, as well as in many of the processes of color photography. (See COLOR PHOTOGRAPHY.) Great improvements have also been made in photographic lenses within the past quarter of a century, the firm of Zeiss, in Jena, having been most active in the development of the modern photographic objective.

It is impossible to predict what the future has in store for photography. Still more sensitive plates would be of immense use, particularly in scientific photography, and it is not by any means impossible that some new discovery may give us at any time a plate ten times as rapid as the present one. What is most desired, however, is some satisfactory color process, which can hardly be expected until some one is fortunate to discover that unknown chemical which has the property of assuming a color similar in hue to the color of the light which illuminates it, and *retaining that color permanently*, a discovery of which there is no immediate promise.

COLOR PHOTOGRAPHY. — At the very beginning of the art of photography it was observed that traces of color sometimes appeared in the picture which bore some resemblance to the color of the light acting on the plate. Photographs of the solar spectrum were obtained in this way at the beginning of the last century, in which the colors were reproduced with more or less fidelity, but no method was discovered of rendering the colors permanent, and it is only within the last few years that satisfactory methods have been devised of producing colored pictures by the aid of photography. The methods in use at the present time may be divided into two classes, the direct, in which the color is produced by the action of the light, and the indirect, in which the color is applied subsequent to the taking of the picture, the photographic process being modified so as to cause the colors to distribute themselves properly in the finished picture.

The only successful process of the first class is that of Lippmann, the French physicist, whose method was carefully worked out by theory before a single experiment was tried. Lippmann's process is essentially as follows: A photographic plate is placed in a holder with the glass side toward the lens of the camera, and mercury is poured into the back of the holder, forming a metallic mirror in contact with the sensitive surface of the plate. The light after passing through the film is reflected back through the film in the opposite direction by the quicksilver mirror. A very remarkable thing now takes place. The reflected light waves from the mirror interfere with the oncoming waves, producing what are known as stationary waves in the sensitive film. Now while ordinary light waves

deposit the silver in the film in a solid mass, the stationary waves have the singular power of depositing it in exceedingly thin laminæ or films, each one thinner than the thinnest gold leaf. The thickness of the silver laminæ varies with the color of the light producing them, red light or long waves producing thicker films than blue light or short waves. Thin films we know show brilliant colors by reflected light, the commonest example being the soap bubble, and the silver laminæ in Lippmann's pictures show color in exactly the same way. The color of any part of the bubble depends on the thickness of the soap film, and in the same way the color of any portion of the photograph depends on the thickness of the silver films deposited by the light waves in that place. The curious thing about the process is that light of any given color will deposit films of just the right thickness to show the same color by reflected light after the plate is developed and fixed in the usual manner. And what is still more remarkable, this fact was recognized by the inventor of the process before any of his experimental work was done. The production of pictures by this method has thus far been confined to the laboratory, the conditions for success not yet being quite fully understood. Probably not more than half a dozen people in the world have succeeded in getting satisfactory results, owing to the experimental difficulties.

Of the indirect processes there are a number which have been developed far enough to be considered commercial successes. These processes are all based on the principle that any color can be imitated by a mixture of the three primary colors, red, green, and blue. The most beautiful results have been obtained by Mr. Ives of Philadelphia, one of the pioneers in this line of work, whose process consists, briefly, in taking three negatives of the subject through red, green, and blue glasses. These glasses prevent light of any other color than that which they are designed to transmit from getting at the plate; consequently each negative is a record of the distribution of one of the three primary colors in the original. From these negatives three transparencies on glass are printed, which, when thrown superimposed on a screen by means of three lanterns furnished with colored glasses similar to the ones used in taking the pictures, combine to form a very perfect reproduction of the original.

For exhibiting the pictures without the lanterns Mr. Ives has devised an instrument which he has named the "kromskop," in which the colored images are combined by reflectors. The pictures are stereoscopic as well, and the result is a reproduction so perfect that it is almost impossible to believe that we are not looking at the original object itself, for it stands out in full perspective with every color perfect.

Colored pictures can be produced from the three negatives taken through the colored glasses by making prints on thin glass plates coated with gelatine, staining them with aniline colors and then mounting them in superposition. The results obtained this way are, however, very inferior to those obtained by means of the kromskop, though they have the advantage of requiring no special instrument for their exhibition.

Another process, which was perfected independently and almost simultaneously by Dr. Joly of Edinburgh, and Mr. McDonough of Chicago, has been recently put upon a commercial basis. In this process the negative is taken on a plate in front of which is placed a screen ruled with very fine lines in red, green, and blue ink, the colors following each other in succession across the screen. This screen breaks up the picture into linear strips, any one of which may be regarded as a record of one of the three primary colors along that portion of the picture. From the negative obtained in this way a positive is printed on glass, which, when mounted in contact with a similar tri-color ruled screen, reproduces the colors of the original. The objection to this method is the obtrusiveness of the lines, especially when the pictures are projected. The colors are much weaker and less faithfully reproduced than by the kromskop method.

Still a third method has been recently devised by Professor Wood of the University of Wisconsin, in which the colors are produced by the diffraction of light. The peculiar advantage of this process is that the pictures may be duplicated by contact printing the same as ordinary pictures, but they require a special apparatus for their exhibition, and their preparation is a matter of considerable difficulty. This method, like that of Lippmann, has not yet got beyond the experimental stage. R. W. Wood.

Pho'tograv'ure. The expense of photogravure work greatly limits its use mostly to high-class bookwork. Large pictures, however, are produced by it, which rival the finest steel engraving in finish and delicacy. The photographs can be reproduced, but the process is largely employed for obtaining engravings, such as copies of celebrated pictures. The process is so nearly perfect that any touch of the painter's brush is clearly seen in the copy. We here give one of the methods. (See PHOTOGRAPHY for sensitized plate, negative, etc.) A gelatine relief is obtained by exposing bichromated gelatine to the action of light beneath a negative. The gelatine used is mixed with a certain quantity of black lead in a more or less granular form This causes the relief to have a surface which is granular in character, and also makes it a conducting one for electricity. Put now into an electrotype bath; it will soon be covered with a deposit of copper. A copper printing-plate is thus made, from which pictures are printed.

Pho'tophone, a curious instrument invented by Graham Bell in 1880. It is based upon the

fact, discovered by J. E. Mayhew in 1873, that the resistance of annealed selenium is less in sunlight than in the dark. Using a piece of thin silvered glass on a diaphragm, Bell was able, by means of the human voice, to deflect a pencil of sunlight so that, with each pulsation of the voice, a distant piece of selenium was alternately illuminated and left in the dark. This piece of selenium was in the circuit of a telephone receiver and a battery, so that at each illumination a sudden increase of current passed through the receiver, because the resistance of the selenium was diminished. One with his ear at the receiver, therefore, heard every pulsation of the voice that deflected the sunbeam upon the selenium. Such an instrument he called a "photophone."

Photosyntax (*fō'tō-sin'tăks*), a term formerly used for photosynthesis (which see).

Photosynthesis (*fō'tō-sin'thĕ-sis*), the process by which green plants make sugar, starch, and similar food. The materials used for this are carbon dioxide and water. The former is obtained chiefly (if not exclusively) by the leaves and twigs from the air, where it constitutes three parts in 10,000. It passes through the stomata (which see, also AĔRATION) by diffusion, dissolves in the water, saturating the cell walls, and so enters the cells. The organs by which the food is made are the minute green bodies, called chloroplasts, or chlorophyll bodies, which give the plant its color. They are composed of protoplasm, which holds a green dye, chlorophyll (which see), and are imbedded in the colorless protoplasm of those cells which lie near the surface of a plant. The chlorophyll absorbs some of the light, especially the red and yellow parts, and this energy is used (how is unknown) in the process of food-making. Even twilight (not moonlight) suffices for some photosynthesis; the amount of food made is proportional, other things being equal, to the brightness of the light. The details of the process are not known. Usually a sugar appears as the end product; this increases to a certain amount in the water of the cell; some of it is turned into starch, minute granules being formed in the chloroplasts. The food is constantly being carried away to places of use or storage. In daylight, food is usually produced more rapidly than it can be disposed of, but as photosynthesis ceases at night, the surplus is then removed.

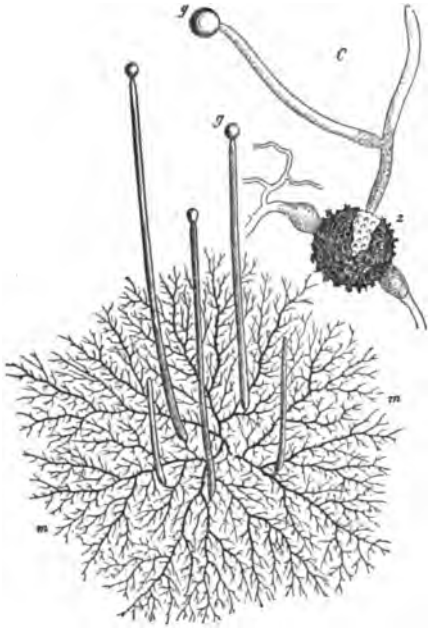
Phototaxis (*fō-tō-tăk'sis*) (in plants), the sensitiveness of an organism, free to move about, to unequal illumination (see IRRITABILITY), to which it responds by taking up a definite attitude with respect to the direction from which the brighter light acts. Only water plants are free to respond. Diatoms, desmids, some filamentous algæ, and zoospores of algæ and fungi show these reactions. Algal zoospores swim toward light and fungous zoospores swim away from it.

Phren'ology. In popular language, phrenology may be defined as the theory of mental philosophy based on the size, or the relative size, of the different parts of the brain. It claims that we can localize the different parts of the brain which give rise to different mental functions. Phrenologists make a map of the cranium, writing on one division, self-esteem; on another, wit, and so on. Examining your head, the phrenologist will put his finger on one point and say, "This man has a large development of self-esteem." Moving his hand to another bump, "This man is lacking in veneration," or "He has a great power of language," or "He has to try hard to give exact statements," and so on. The cultivated phrenologist thus goes through all the divisions of mental and moral qualities, finding a local boundary in the brain for each. In Britain, Gall, Spurgheim, and George and Andrew Combe, may be mentioned as representative phrenologists. In America, the more noted are Dr. Charles Caldwell, the brothers Fowler, and Wells.

Phryg'ia, an ancient country of Asia Minor, whose boundaries varied at different periods. It is supposed that at one time Phrygia included most of the peninsula. In general, it was a high plateau which afforded pasturage for flocks. Gold was found in the mountains and streams. Vines were cultivated in some districts, and Phrygia marble was greatly prized. Phyrgia was conquered by Crœsus in the 6th century, and he in turn was conquered by the Persians in 549. The influence of the Phrygian religion is traced in Greek mythology.

Phycomycetes (*fī'kō-mī-sē'tēz*), plants forming one of the great groups of fungi, which is distinguished by being more like the algæ in structure and reproductive habits than any of the fungus groups. The name means "alga-like fungi." The mycelium is composed of coenocytic threads or hyphæ, that is, filaments which contain no partitions. (See COENOCYTE). It seems to be more than probable that the group has been derived from the green algæ. Prominent members of the group are as follows: Saprolegnia forms are known as "water moulds," because they live upon the dead bodies of water plants and animals, sometimes attacking living fish, one species being very destructive to fish in hatcheries. It is interesting to note that this group of Fungi has retained the aquatic habit of the algæ. As a consequence, its asexual spores are ciliated and have the power of swimming. Another feature of the water-moulds is that the oogonium sometimes forms several eggs, and that frequently the eggs form new plants without any fertilization, being an illustration of the habit called parthenogenesis (which see). The mucor forms are well represented by the "black moulds," which form white furry growths on damp bread, manure heaps, etc. From the pros-

trate mycelium numerous erect branches arise, each bearing at its summit a globular sporangium containing numerous asexual



Mould, showing mycelium (*m*), young sporangia (*g*), and fertilized egg (*z*).

spores. The mucors are isogamous (which see). The peronospora forms are the "downy mildews" which are very common internal parasites on seed plants, one of the most common kinds attacking grape leaves. The presence of the parasite is made known by discolored and finally deadened spots on the leaves where the tissues have been killed. The spore-bearing branches rise above the surface of the leaf, and many of them arising near together, they form little velvety patches suggesting the name downy mildew. These forms are heterogamous. See HETEROGAMY.

Phyl'loclad (in plants). See CLADOPHYLL.

Phyllodia (*fi-lō'di-a*), (in plants), petioles which resemble leaves in form and function. The most conspicuous display of phyllodia is among the acacias, especially those of Australia. The normal leaves are pinnately compound, but for the most part they do not develop, the petiole becoming flat and doing the leaf work.

Phyllotaxy (*fil'lo-tăk'sy*). The name literally means "leaf arrangement," and has to do with the distribution of leaves upon the stem and the laws which govern it. In general, there are two types of leaf arrangement: that in which the two or more leaves are developed at the same node, giving rise to what is called the "verticillate" or "cyclic" arrangement; and that in which but a single leaf occurs at each node, giving rise to the "alternate" or "spiral" arrangement. In the case of the spiral arrangement, some relations have been discovered which seem to be more curious than important. In the simplest cases, the leaves occur in two vertical rows, the angular divergence between any two successive leaves being one-half of the circumference of the stem, or 180°. This type of phyllotaxy is designated by the fraction $\frac{1}{2}$, which shows the angular divergence, while the denominator indicates the number of vertical ranks. In the next higher series, the leaves occur in three rows, the angular divergence between successive leaves being one-third the circumference, or 120°. The fraction $\frac{1}{3}$ designates this arrangement. The next higher arrangement, is the one in which there are five vertical rows, but in order to reach a leaf standing directly over the one started from, a spiral is traced twice around the stem. The angular divergence between two successive leaves, therefore, is two-fifths of the circumference, or 144°, and this arrangement is designated by the fraction $\frac{2}{5}$. It has been found that any fraction may be derived by adding the numerators and denominators of the two preceding fractions. For example, the next higher arrangement would be $\frac{3}{8}$, which means that the angular divergence is three-eighths the circumference of the stem, that is, eight leaves are passed before one is reached standing directly over the one started from, and in finding the eighth leaf a spiral has been traced three times around the stem. Such high orders of arrangement, as $\frac{5}{13}$, $\frac{8}{21}$, etc., are displayed in pine cones.

Phyllox'era. Se GRAPE PHYLLOXERA.

Phys'ical Sci'ence, a term used in contrast with *natural* science to denote all those sciences which deal especially with inanimate matter. This distinction between *natural* and *physical* sciences, which was explicitly suggested by Maxwell, would reserve natural science for the subjects considered under the heads of Zoology, Botany, Paleontology, Physiology, Anatomy, Psychology, Anthropology, Ethnology, etc., all of which deal with life in some of its aspects; while among the physical sciences would be included Physics, Chemistry, Mineralogy, Geology, Astronomy, etc. This classification would make Biology the fundamental science of the natural group and Physics the foundation of the physical group. Physical Science may be defined, therefore, as that branch of learning which deals especially with energy and with inanimate matter.

It should be borne in mind by the student that *physical* and *natural* originally meant the same thing, the only difference being that the former is of Greek origin, while the latter comes from the Latin. Accordingly, we still find a great diversity of usage. Thus Lord Kelvin still speaks of a certain physicist as a "distinguished naturalist." The distinction

suggested by Maxwell is, however, being rapidly adopted.

The unprecedented growth of physical science during the 19th century has had the effect of enormously subdividing the subject. Thus astronomy which is, in fact, the simplest branch of physics requires a peculiar set of instruments for its pursuit and is, therefore, no longer studied under the head of physics. The same is true of chemistry, which is the physics of the molecule: it has become a large subject requiring a special equipment, and is now a science quite separate from physics. Such was, however, not the case when Robert Boyle studied physics and chemistry. In like manner, geology is the *physics of the Earth's Crust;* but it must be studied afield as well as in a special laboratory and is, hence, a separate and very important science. Mineralogy also deals with the physics of a special group of bodies. But these bodies are so vast in number and so enormously important in commerce that they must be studied elaborately and carefully under a special head, and with a special equipment.

Turning now from the *pure* physical sciences to the *applied* physical sciences, we find them grouped under the general head of *engineering*, which in turn has already been extensively subdivided. It is the rapid advance in physical science which has made possible the rapid improvements in modern civilization, somewhat in the same manner that the rapid advances in natural science have made possible a more powerful and beneficent science of medicine and have introduced into modern thought the controlling principle of evolution.

Physics (*fĭz'ĭks*), in its broad sense, is that science which deals with the properties of matter and of energy. In its narrow sense, physics is defined in such a way as to exclude those properties of matter which depend upon its composition (referring them to chemistry), and those properties of matter which are exhibited only in living beings (referring them to biology).

For many years, however, there has ceased to be any sharp distinction between physics and chemistry, witness the new sciences, physical chemistry and electro chemistry.

Popularly defined, physics is made up of the sciences of mechanics, heat, light, sound, electricity, and magnetism. A sounder view is that which regards physics as the application of dynamics to the phenomena of sound, heat, light, electricity, and magnetism.

The subject of physics in this work has been treated under separate heads, accordingly see ARTICLES, DYNAMICS, ACOUSTICS, HEAT, LIGHT, ELECTRICITY, MAGNETISM, ELASTICITY.

Physiog'raphy. SCOPE OF THE SUBJECT.—This term has but recently come into use, and its meaning is not yet clearly and uniformly defined. In England, physiography is regarded as the introduction to physical science in general. It is made to include the elements of physics, chemistry, astronomy, physical geography, and geology, and sometimes even certain phases of botany and zoology. In America, the term has a somewhat different meaning. It is sometimes used as a synonym for physical geography, and it is sometimes defined as the science which describes and explains the physical features of the earth's surface. In this latter sense it is the correlative of meteorology, which treats of the atmosphere, and of oceanography, which treats of the oceans. According to early usage, the term physical geography meant a description of the earth's physical features; but physiography does not content itself with a mere description of physical features. It attempts also to explain how existing physical features originated. This indeed is the fundamental distinction between physiography, as the term is commonly used in America, and that part of physical geography which deals with the physical features of the earth's surface. In its attempt to explain the origin of the present features of the earth's surface, physiography necessarily draws, to some extent, on the past history of the earth; that is, on geology. Between physiography and geology, therefore, there is no sharp line of division. The present features of the earth are the surface expression of the geological processes which have operated in the past. The relation of physiography to geology may be likened to the relation of political geography to history. Political geography is an expression, in one form, of history. The political geography of all stages of history would be, from one point of view, a summary of history. Similarly, if the physiography of each stage of the earth's history were known, this knowledge would give us, from one point of view, the complete history of the earth.

The atmosphere is as much a part of the earth as the rocks are. The study of the atmosphere is meteorology, but, even in its narrowest meaning, physiography includes the consideration of the atmospheric forces and processes which have shaped, or helped to shape, the present surface of the land. This includes the movements of the air (winds), the moisture of the air, especially precipitation, the changes of temperature, and the chemical changes effected, directly or indirectly, through the influence of the atmosphere. While meteorology includes the study of atmospheric movements as such, physiography, in its narrower sense, includes only the effects of those movements on that part of the earth which lies below the atmosphere. The ocean, likewise, is a part of the earth. The science which deals with the ocean, as such, is oceanography; but the consideration of the ocean as a part of the earth falls within the province of geology, while a consideration of the effects of oceanic activities which modify the surface of the solid part of the earth falls within the scope of physiography. Thus, the effects

of rivers, waves, currents, etc., on the configuration of the solid part of the earth fall within the province of physiography. Physiography, therefore, concerns itself primarily with the topographic results of geologic processes. It is a special phase of geology. Since the geological processes which have left pronounced topographic results are the processes of late geological time, physiography has to do with but a brief part of the earth's history.

PHYSIOGRAPHIC PROCESSES. — Powell long ago grouped all processes that work on the earth's surface into three classes: (1) The processes of diastrophism; (2) the processes of vulcanism, and (3) the processes of gradation. *Diastrophism* includes the up and down movements of the earth's crust, movements which, however gentle and slow, are continually in progress. *Vulcanism* includes all processes connected with volcanoes. *Gradation* includes all processes by which material is shifted from one point on the earth's surface to another. The centers of diastrophic and volcanic activity are beneath the surface. The processes of gradation are in operation on the surface, chiefly at the plane of contact between atmosphere and land, and between water and the solid part of the earth beneath it. The transfer of material in gradation is usually from higher to lower levels. Thus rivers carry debris from land to sea. They *degrade* the land, and the material, deposited in the sea, *aggrades* its bottom. Glaciers, likewise, carry material from higher levels to lower. They degrade the places where they gather debris, and aggrade the places where they leave it. The degradation of one place generally involves the aggradation of another. The sand and dust blown by the wind constitute a partial exception to the rule that the materials shifted about on the earth's surface are transferred from higher to lower levels.

LAND AND WATER AREAS. — The greatest features of the earth's crust are the elevations known as continents, in contrast with the depressions known as ocean basins. The sharp topographic division-line between continents and ocean basins does not correspond with the borders of the continental land areas. For a distance about the continental lands the water is very shallow. There is then a sudden descent of the bottom to much greater depths. The area beneath the shallow water is the *continental shelf*. Its outer border is usually about 100 fathoms below the level of the sea. From the physiographic point of view, the outer edge of the continental shelf is the border of the continent. While the explanation of the existence of continents and ocean basins is a problem of physiography, it is an unsolved problem. No assertion can be made at the present time as to how these greatest of physical features originated. The continents have sometimes been looked on as uplifted portions of the earth's crust; but it would perhaps be quite as near the truth to consider the ocean basins as depressed portions. It is, however, far from certain that the surface of the solid part of the earth was ever regular. If the continents were lifted up, or if they were left up as the result of the sinking of the ocean basins, they are the result of diastrophism. If this was not their origin, they probably came into existence when the earth was in process of formation, whatever that process was. Smaller land masses, that is, islands, have originated in various ways. Some are diastrophic, some are gradational (aggradational), and many are volcanic.

Physiography has to do with both the horizontal and vertical configuration of land areas and sea. The horizontal configuration of the one is the counterpart of the horizontal configuration of the other; but the vertical configuration of the one stands in no necessary relation to that of the other.

THE HORIZONTAL CONFIGURATION OF LAND AREAS. — It is the province of physiography to define, classify, and explain the origin of all sorts of horizontal irregularities of land areas. Among the horizontal irregularities of the land are peninsulas, capes, etc., or land masses projecting into the sea. Among the horizontal irregularities of the ocean are gulfs, bays, etc., or bodies of water projecting into the land. The sizes, positions, and shapes of these irregularities are readily expressed on maps. Not so their origin. They have, indeed, originated in many different ways. For example, the uplift of an area of sea bottom along a line at right angles to the coast of a continent, would give rise to a peninsula, like Florida. The uplift of two such peninsulas near each other might leave a gulf or bay between them. Again, the sinking of a coast allows the sea to invade the lower ends of the river valleys, forming bays, such as Delaware bay and Chesapeake bay. When the sea converts the lower ends of adjacent valleys into bays, it leaves a peninsula between. Peninsulas and bays formed in this way are the results of diastrophism. Small peninsulas or capes, like Cape May, may be built by deposits of sand and gravel made by waves and shore currents. They are the result of gradation, in this case of aggradation. Glaciers moving down valleys to the sea, as in high latitudes, may gouge out the lower ends of the valleys through which they pass, cutting them down far below sea level. When the ice melts, deep, narrow bays or *fiords*, like those of Greenland, Norway, Alaska, etc., are the result. Such bays are a result of gradation, in this case degradation. Volcanic activity on a coast line may result in extending the land, making a cape, or in destroying land which previously existed, leaving a bay. Thus horizontal irregularities may arise by vulcanism, as well as by diastrophism and gradation. Horizontal irregularities arise in many ways not here enumerated, especially by various processes of gradation; but the fore-

going illustrations will suffice to show that horizontal irregularities may result from any one of the three sets of processes referred to above. The horizontal configuration of a land area may be altered by animal or plant life, as when coral reefs are constructed, or when mangrove trees invade the water, extending the land. These may be looked on as special cases of aggradation.

Relief Features of the First Order. — Physiography has also to do with the vertical configuration of the land. The great relief types are three: Plains, plateaus, and mountains.

Plains are relatively low areas of considerable extent, with surfaces which are not notably rough. *Plateaus* are similar tracts of greater altitude, and which stand up more or less prominently above their surroundings on one or more sides. *Mountains* usually have less areal extent, and stand up more conspicuously above their surroundings. They generally have somewhat narrow summits and steep slopes.

As topographic features, plateaus and plains may be said to differ from one another chiefly in elevation; yet there is no specific elevation above which land may not rise, and remain a plain. Formerly, plains were often defined as lands below 1,000 feet in elevation; but this arbitrary definition has no warrant in nature or in usage. The fact is, that plains often grade into plateaus, and that there is no sharp line of demarkation or basis of separation which is uniformly applicable. An extensive tract of land, 500 feet above the sea, would probably be called a plain if it were surrounded, or nearly surrounded, by higher land, or if it were bordered by notably high land on one side, and descended gradually to much lower levels on others. On the other hand, a tract of land, 500 feet above the sea, would probably be called a plateau if it were bordered on one or more sides by a tract of considerable extent, which had an elevation of but 100 or 200 feet, particularly if the descent to the lower level were abrupt. Extensive areas 1,000 feet, or even considerably more, above the sea, would probably be called plains rather than plateaus, if they were surrounded, or largely surrounded, by higher lands, while they would be called plateaus if they stood up distinctly above their surroundings. Thus parts of the *plains* of the Mississippi basin are higher than parts of the Piedmont *plateau* lying east of the Appalachian mountains. It is, therefore, a question of surroundings and relations, rather than actual elevation above the sea, which determines whether a tract shall be called a plain or a plateau.

A plateau may be bordered by slopes which descend abruptly on all sides, or by slopes which descend gently on all sides; or a plateau may descend abruptly or gently on one side, and be bordered by a higher plateau or by a mountain range on another. In the latter case, the rise to the higher slopes may be abrupt or gentle. If abrupt, the separation of plateau and mountain is distinct; if gentle, the one grades into the other. If a high plateau becomes narrow and long, and if it descends in all directions, or on both sides, it may approach a mountain range in form.

Mountains are not more sharply defined than plains and plateaus. The term mountain implies notable elevation, but a mountain is not necessarily higher than a plateau. Thus the plateau of Thibet is much higher than any part of the Appalachian mountain system. The term mountain implies (1) a considerable elevation above surroundings, and (2) crests of limited area. An isolated elevation 1,000 feet above its surroundings, rising abruptly above a low flat plain, would doubtless be called a mountain, though an elevation, of the same height, with gentler slopes, on a rolling plateau, might not be.

It is the task of physiography to describe the forms and relations of plains, plateaus, and mountains, to explain how they came into existence, and how they came to assume the forms which they now have. Some plains originated by diastrophism, as by the elevation of shallow sea bottom enough to convert it into land; others are the result of aggradation, the building up of sea-bottom slightly above the level of the sea; others are the result of the degradation of mountains and plateaus; and still others owe their origin to the combined action of diastrophic and gradational forces. Subsequent to the origin of plains, their surfaces have been modified by rain, rivers, winds, glaciers, etc. It is the task of physiography to determine the nature and the extent of the changes which these several agencies have effected. Plateaus are the result either of diastrophism or vulcanism, or both. They are plains elevated to the condition of plateaus, or, less commonly, they are built up by lava flows. After they come into existence, plateaus are subject to the same changes as plains. Mountains have originated in various ways: by diastrophism, as in the case of mountains formed by the upfolding of the superficial strata of the earth's crust, or by the up-thrust of blocks of the earth's crust; by volcanoes, as in the case of volcanic peaks; and by gradation. The origin of mountains by gradation will be referred to later. Like plains and plateaus, mountains are modified by wind and water and air, after they are formed. Physiography essays to explain how they originated, and how far their present forms are the result of original uplift or upbuilding, and how far the result of subsequent gradation.

Minor Relief Features. — The great relief forms, plains, plateaus, and mountains, are affected by numerous smaller relief features. Thus, a plain or a plateau may be affected by depressions (valleys) cut out by streams. Between the valleys, elevations remain. If

the elevations be long and narrow, they are *ridges;* if short, *hills.* The valleys are *made;* the ridges and hills are *left.* As a result of the excavation of valleys, plains may be far from flat. Generally speaking, the valleys are deep in proportion as the land is high. The valleys of plateaus are, on the whole, deeper than those of plains, and the ridges and hills between them are therefore higher. If the ridges or hills be very high, they may be called mountains. For example, the Catskill mountains are simply the big hills left in the erosion of the plateau which once existed where the mountains now are. The depressions between the mountainous hills have been worn out by running water. It is thus that mountains originate as the result of gradational processes, operating on plateaus. Special names are given to special forms of hills or mountains, developed by erosion. Here belong *buttes*, large, flat-topped, high hills developed by erosion in arid regions; *mesas*, which are more extensive remnants of plateaus, etc.

Along valley bottoms, whether the valleys are in plains, plateaus, or mountains, narrow *alluvial* plains are often developed. So, too, about the borders of lakes, whether in plains, plateaus, or mountains, low, flat *lacustrine* plains of limited extent are made, either as the result of deposition in the lake, or as the result of the lowering of its level, or both. Lacustrine and alluvial plains are minor, secondary features, in relief forms of the first order. Small plains are also developed in other ways. Along streams and lakes, or along the ocean, terraces are often developed. They represent other minor topographic forms developed in plains, plateaus, or mountains.

Between highlands and lowlands there are always *slopes.* The slopes between mountains and plateaus are parts of the mountains and plateaus, respectively. So, too, the slopes between the surface of a plateau and the bottom of a valley cut in it are parts both of the plateau and of the valley. Yet slopes constitute a somewhat distinct class of topographic forms. If slopes are very steep, and especially if they are steep and high, they are called *cliffs.* Cliffs occur along sea and lake shores, as well as along valleys. It is within the province of physiography to explain how these secondary and minor features, such as alluvial plains, lacustrine plains, terraces, slopes, cliffs, etc., arose, and how their individual peculiarities of form were developed.

Another topographic form is the *basin.* Basins, like most topographic types, are of various sorts. Some of them are large and some are small. They may affect the surfaces of plains or of plateaus, or they may occur among mountains. Some of them have outlets, and some have not. Those which have not may give rise to lakes, ponds, etc. Ponds and lakes may have outlets, but below the level of the outlet there is a basin which has no outlet, else there would be no lake or pond. Other so-called basins are inclosed on three sides and open on the fourth, or at least at some one point. It is customary to speak of the great depression between the Appalachian mountains on the east, the Rockies on the west, and the Height of Land on the north, as the Mississippi basin, although it is by no means completely inclosed by high land. It is the function of physiography to define the various types of basins, and to explain their modes of origin and their individual characteristics.

CONFIGURATION OF THE SEA BOTTOM.—The configuration of the sea bottom also falls within the province of physiography; and, while the sea bottom is less familiar than the land, its general features are known. It is known, for example, that there are great areas of the sea bottom elevated above their surroundings. Such areas are comparable, in some sense, to the plateaus on land. There are great areas where the ocean bed is depressed, relative to the areas just referred to. Such areas are comparable to the plains of the land. There are other depressions in the ocean bed, more limited in area, which are comparable to basins on the land, though some of them are much larger, both in area and depth, than the inclosed basins on the land. Many parts of the ocean basin have been affected by vulcanism. Volcanic peaks are, on the whole, more notable features of the ocean bottom than of the land. In its fundamental features, or features of the first order, therefore, the ocean bed has some likeness to the land. But gradational, and especially degradational agencies, are hardly operative on the ocean bottom, except in very shallow water. Since it is degradational agencies which produce the most notable secondary features of land surfaces, and since these agencies are little operative in the sea, the sea bottom is, in general, without the hills the ridges, the mountain peaks due to erosion, the valleys, valley plains, and terraces, which abound on the land. These physiographic forms are sometimes found on the sea bottom, and the areas where they occur are thought to have been land at one time, though now submerged. On the other hand, the shallow sea bottom is affected by bars, reefs, etc., built by waves and shore currents, and by coral polyps. Reefs are not formed on land, and only occur there, when an area of sea bottom is elevated to the estate of land.

REFERENCES.—*Davis' Physical Geography* (Ginn); *Geikie's Earth Sculpture* (Putnam); *Physiography of the United States* (American Book Co.); *Jukes-Brown's Physical Geology* (Bell); much of dynamic geology, in any textbook on geology; those portions of textbooks on physical geography which deal with the land and with the configuration of the ocean beds; all treatises on rivers, lakes, glaciers, such as Russell's (Ginn). *Volcanoes;* Judd's (Appleton) *Physio-*

graphic Atlases of the U. S. Geological Survey, etc. R. D. SALISBURY.

Physiol'ogy. Anatomy shows us that animals and plants are wonderfully constructed. But after we understand their architecture, and even their minute structure, the questions remain: What are all the organs and tissues for, and what takes place within the parts that are actually alive? Physiology attempts to answer questions of this nature. It therefore stands in contrast with anatomy and is supplementary to it. The activities of the body are varied and depend on life for their manifestation — they may be called vital activities. Physiology embraces a study of them all. This subject began to attract the attention of the ancient medical men, who wished to fathom the activities of the body in order to heal it in disease. But it is such a difficult thing to begin to comprehend the activities of life, that even the simpler relationships were imperfectly understood, and they resorted to mystical explanations. They spoke of spirits and humors in the body as causing the various changes. The arteries were supposed to carry air, the veins only blood, and nothing was known of the circulation. In these early days, also, anatomy, physiology, and medicine were all united into a poorly digested mass of facts and fancies. This state of affairs lasted till the 16th century and then the awakening came through the efforts of gifted men endued with the spirit of independent investigation. The advances made depended upon the work or leadership of these men, and certain periods of especial importance should be pointed out.

First is the period of Harvey (1578–1657). In his time the old idea of spirits and humors was giving way, but there was still much vagueness about the relationships and activities of the body. He helped to illuminate the subject by showing a connection between arteries and veins and demonstrating the circulation of the blood. Harvey did not see the blood passing through the capillaries from arteries to veins, but his reasoning was unassailable that such a connection must exist, and that the blood made a complete circulation. He gave this conclusion in his medical lectures as early as 1619, but did not publish his views until 1628. It was reserved for Malpighi, in 1661, actually to see the circulation through capillaries under the microscope, and for Leeuwenhoek, in 1669 and later years, greatly to extend the observations. The next great period was marked by the work of Haller (1708–77), who made physiology an independent subject. It had previously been united with anatomy and medicine; he made it a subject to be studied for its own sake. The period that marks the beginning of modern physiology came next, and was due to the genius and force of Johannes Müller (1801–58). He studied physiology so broadly that he made it comparative. He used every means at his command — experiment, observations on simpler animals, the microscope, the discoveries in physics, chemistry, and psychology. He made physiology systematic and broadly comparative, and gained for himself the title of the "greatest physiologist of modern times." Not only did he do important work himself, but, as professor of physiology at Berlin, he trained many talented young men, among whom were Ludwig (1816–95), Du Bois-Reymond (1818–96), and Helmholtz (1821–94). Thus his influence reached to the present time and affected recent physiology. With these distinguished German physiologists should be mentioned Claude Bernard (1813–78) of France, and Sir Michael Foster of England (1836–).

Physiology has broadened and deepened until it includes the vital activities of the entire animal and vegetable worlds. Every action or function dependent upon life is embraced by it. These are so varied that they must be reduced to order and system, and, when that has been done, we observe that all the functions may be grouped under three great headings. Those concerned with Nutrition, those connected with Relation, and those pertaining to Reproduction. The division nutrition embraces every activity concerned in nourishing the body. It must include a discussion of the blood, its structure, circulation, and changes. All about the heart and the influences which affect it. The digestive system, the kinds of food, the nature of digestion, the absorption of the food into the circulation, the secretion of substances like the digestive juices and other forms of secretions in the body, the action of the liver, pancreas, and similar organs. Respiration is connected with nutrition, because the oxygen brought in is used in all processes of the body, and the removal of the carbon dioxide (Co_2) is an aid to nutrition. One must, therefore, learn all about the breathing organs, and the nature of the exchanges between the blood, the air, and the tissues. The living protoplasm of the body is continually undergoing disintegration, it breaks into carbon dioxide, water, and nitrogenous compounds. In order that nutrition may be effectively carried on these waste products must be removed. This topic includes the action of the kidneys, the lungs, and the skin. The varied chemical changes in assimilating the food, and the reverse set of changes resulting in the liberation of energy must be considered under the heading Nutrition.

Another great division of physiology deals with the means by which an animal or plant is brought into proper relation with its surroundings. This includes, in higher animals, the action of the nervous system and sense-organs, as well as control of the nervous system over the organs. The muscles and organs of protection are also involved in bringing about a harmonious relation between surroundings and the animal. Finally, repro-

duction refers to the preservation of the race, and is more for the benefit of the race, generally speaking, than for the individual.

A study of all these varied activities is physiology. Reference must be made to text-books and manuals for further consideration. It is a common fault with our elementary physiologies, to go too much into the discussion of the effects of alcohol and narcotics. The importance of such a discussion is unquestioned, but the facts of physiology and hygiene should stand out in unrivaled prominence. Among the smaller texts, Huxley's *Lessons in Elementary Physiology* (new edition, 1900), is the most lucid statement of the facts of physiology yet presented. Among the best books of greater extent may be mentioned the following: Fosters' *Text-book of Physiology* (4 vols., fifth edition, 1891–93); Stewart's *Manual of Physiology* (third edition, 1898); Kirke's *Handbook of Physiology* (the latest edition); Howell's *An American Text-book of Physiology* (1896); Verworn's *General Physiology* (1899); Martin's *The Human Body;* Hall's *Text-book of Physiology* (1899). See BLOOD, CIRCULATION, HEART, LIVER, MUSCLE, NERVES, RESPIRATION, etc. WM. A. LOCY.

Physiol'ogy (of plants), that branch of science which treats of the activities of living beings. These are essentially the same in plants as in animals, but are often simpler. Plant physiology is concerned with the action of the plant body as a whole, the part which each of its organs takes, and the ways in which they are adjusted to one another and to the external world. (See also ECOLOGY.) The work of a particular part, or organ, is called its function. The important general functions of plants are absorption, water transfer, transpiration, nutrition (in the narrower sense) including digestion, photosynthesis, and assimilation, secretion, respiration, growth, and movement. (See these topics; also IRRITABILITY.) In the higher plants, the root is an absorbing organ for water, mineral salts, and such organic matter as is soluble in water; the root, stem, and leaves are furnished with strands of tissues along which water and foods can travel readily; the leaves and the surface of the stem, at least when young, are organs of absorption and evolution of the gases carbon dioxide and oxygen; they also lose water by evaporation, and are most important as organs for the making of carbohydrate foods. All these functions, however, may go on in a single cell of one of the simplest plants.

Pian'oforte, a stringed musical instrument played by keys, developed out of the clavichord and harpsichord. It differs from these chiefly in the introduction of hammers with which to put the strings in vibration, connected with the keys by a mechanism that enables the player to modify at will the intensity of the sounds. It is this peculiarity to which the name is due, *piano* being the Italian for soft, and *forte* for loud. The strings are stretched across a compound frame of wood and metal, composed of bars, rods, and strengtheners of various kinds. This framework includes a wooden sound-board. The mechanism by which hammers are connected with the keys is called the *action* of the instrument. The duration of a note is regulated by the damper. This consists of a piece of leather, resting on the top of the string, and connected with the back part of the key by a vertical wire. When a key is pressed down, its damper is raised off the string so as to allow the sound to be clear and open; but when the finger is taken from the key, the damper wire falls immediately, and the damper presses down on the string, muffling and stopping the vibration. One of the pedals is called the loud one, the other the soft one. Great difference of detail exists in the "actions" of different makes, but in all are the same essential parts. See Hopkins' *Musical Instruments.*

Piaster (*pī-ăs'ter*), "a plaster," in the Latin; in the Romance languages, "any thing spread out," "a plate," "a coin." The word is applied to an old Spanish coin, worth not quite $1.00 of United States money. It was divided into eight reals, and hence was called "a piece of eight." The Italian piaster is an imitation of, and is nearly equal to, the Spanish piaster in value. The Turkish piaster is worth about four cents of United States money.

Pibroch (*pē'brŏk*), a form of bagpipe music, generally of a warlike character. The rhythm is irregular and difficult for a stranger to follow; but played by a good piper it has a powerful effect.

Picayune (*pĭk'ā-ūn'*), a name derived from the Carib language, and used in Louisiana for a small coin worth six and one-quarter cents, current in the United States before 1857, and known by various names in different states — fourpence, fippence, fip, and sixpence.

Pick'erel. See PIKE.

Pick'ering, Edward Charles, a distinguished American astronomer, born at Boston, July 19, 1846; educated at Harvard, where he graduated from the Lawrence Scientific school in 1865. He immediately accepted an instructorship in physics at the Massachusetts Institute of Technology, where he founded the first physical laboratory in America, and where he remained until 1877, when he went to Harvard as professor of astronomy and director of the observatory, a position which he has filled with increasing distinction during a quarter of a century. Professor Pickering's most original work is perhaps along the line of stellar photometry and stellar spectroscopy. But the conception and skillful direction of the many lines of work carried on at the Harvard observatory,

as well as the building up of the observatory itself, must always remain a great service to science and a monument to Professor Pickering. He is a member of the National Academy of Science, the author of several important volumes, and the editor of the *Harvard Annals*, an invaluable series of astronomical reports.

Pick'ett, George Edward, an American soldier who won world-wide distinction in the Confederate service at Gettysburg, where he made one of the most gallant and desperate charges ever known in the history of war. He was born at Richmond, Va., Jan. 25, 1825, and graduated at West Point in time to enter the army as a second-lieutenant during the war with Mexico. He was brevetted first-lieutenant, and afterward captain, for conspicuous bravery in Mexico. He served for the most part on the frontier between 1848 and 1861. At the outbreak of the Civil war, he resigned his commission as captain in the army of the United States and entered the Confederate service as a colonel. He became a major-general in 1862. He was engaged in several desperate battles under Lee, but won special distinction as the leader of the assaulting column, July 3, 1863, upon which the fate of the Confederacy hung. The point reached by his troops in this charge, and from which they were at last driven back, is marked upon the field of Gettysburg to-day by a granite monument. In the campaign of 1864–65, he made the final stand at Five Forks, and he prevented the capture of Petersburg by General Butler. At the close of the war he returned to Richmond and engaged in life-insurance business, dying at Norfolk, Va., July 30, 1875.

GEN. G. E. PICKETT.

Picts, a people, who from 296–844 A. D., inhabited eastern Scotland from the Forth to the Pentland Firth. Sometimes we find them called by the name Cruthnig. The first mention of them in Roman annals is in connection with campaigns in Britain in 296 and 306 A. D. The first mention of the Scots is made in connection with their being united with the Picts in harassing the Romans in 360 A. D. The Pictish kingdom was overthrown about 850 A. D., when the Scots became the predominant race. It is undecided what was the language the Picts spoke, though the prevailing opinion is that they were a Celtic race. See Skene's *Chronicles of the Picts and Scots.*

Pied'mont, the northwest part of the kingdom of Italy, comprising the modern provinces of Turin, Alessandria, Cuneo, and Novara. Area, 11,340 square miles; population 3,417,047. Much of its land is reclaimed by irrigation, and made highly productive. The system of irrigation is well-nigh perfect. It is watered by the upper Po. The country is rich in Waldensian memories.

Pierce, Franklin, fourteenth President of the United States, was born in New Hampshire, Nov. 23, 1804. He early came into political prominence in his native state. In 1837, he was elected to the United States senate, of which he was the youngest member. In 1842, he resigned his seat. He was a Democrat of the Jackson school, and a zealous advocate for the admission of Texas, with or without slavery. He volunteered as a private in the Mexican war, but the President made him a brigadier-general. In 1852, he received the Democratic nomination for the presidency and obtained the electoral votes of all the states, save Vermont, Massachusetts, Tennessee, and Kentucky. During his administration, the Missouri Compromise was repealed by the passage of the Kansas-Nebraska bill. At the close of his administration, he spent three years in Europe; returned home to Concord, but took no part in politics. He died at Concord, N.H., Oct. 8, 1869.

FRANKLIN PIERCE.

Pierre, the capital of South Dakota, is situated near the site of old Fort Pierre, in about the center of the state. The fort was founded in 1829, and was named after one of its early fur traders. The present population of Pierre is 2,306.

Pierre'pont, Edwards, American lawyer and diplomat, was born at New Haven, Conn., in 1817; and died at New York, March 6, 1892. As attorney-general of the United States, he conducted the trial of Surratt, for being an accomplice in the murder of President Lincoln. In 1876, he was sent as minister to Germany. As a jurist he had a wide reputation, and European governments were influenced by his writings upon international law.

Pig. See SWINE.

Pigeon (*pij'un*), a name for members of the dove family. There are about 300 species of pigeons all over the world, being most abundant in the East Indies. Only two are found in the Eastern United States — the wild pigeon, and the turtle dove. The wild pigeon, or passenger pigeon, is now exceedingly rare. It was formerly very abundant, perching in the forests in such numbers as to

break limbs of trees, and covering a large territory in their daily flight in search of food. During migration, they flew in such large flocks that it would sometimes require days for them to pass a particular point. They were nearly exterminated by wholesale slaughter. It is a bird about seventeen inches long, with large wings, and a long pointed tail. The male is bluish above, purple brownish-red below, more violet behind, with a black bill and yellow feet. It depended largely upon acorns and beechnuts for food, with occasional feasts on grain and berries. The turtle dove, or mourning dove, is still quite common. The long, soft, mournful note of the male during the nesting season, is known to nearly everyone in the United States. It is a smaller bird than the passenger pigeon, being about 11¾ inches long. The upper parts are olive grayish brown, the neck iridescent, the breast pinkish, and the belly buff; the outer tail feathers are tipped with white. They nest in isolated pairs and two broods are produced a year. There is a large number of domestic pigeons, all descended from a wild form generally believed to be the blue rock-pigeon, but there is now some reason to doubt this. Pigeon breeding has been engaged in throughout Europe and Eastern countries for centuries. It is a favorite pastime in the United States. A great range of variation has been produced by breeding. Some of the more conspicuous varieties are: the fan-tail, with large spreading tail; the pouter, with inflated breast; the tumbler, carrier, trumpeter, barb, and jacobin. Mr. Darwin made use of pigeons in observing the changes produced in animals under domestication, through the influence of artificial selection. The breed called carrier is not the one used for carrying messages, but the homing pigeon is employed for that purpose. There is no real distinction between doves and pigeons.

PASSENGER PIGEON.

Pig'ments, the color materials of painting. It is necessary to distinguish these from dyeing colors. Pigments are insoluble, and, mixed in oil or water or other liquid, are used for painting. Dye-stuffs are held in solution as tinctorial substances. A pigment must have covering power, that is, it must cover and conceal with an opaque covering the surface on which it is spread. When dry, it must have durability; must resist the air. It should also dry quickly. Pigments for artistic work need to be prepared with more care, and of better material, if possible, than for mechanical purposes. A house can be repainted, but a madonna cannot be. Artists' pigments are ground to a finer powder than ordinary paints.

Pike, a ravenous fresh-water fish, with long slender body, broad snout and large mouth. There are five species of the pike family. One inhabits the fresh waters of both continents; the other four are all American. The muskallunge, attaining a length of eight feet, is the finest and largest of the pikes. It is found in the Great Lake region, and, occasionally, in the Ohio valley. The smaller varieties are commonly called pickerel in the United States. They all rank high as food fishes.

Pike's Peak, a peak of the Rocky mountains, 65 miles south of Denver, in Colorado, discovered by Captain (afterward General) Z. M. Pike, in 1806, 14,134 feet high. A railway from Manitou to the top, nine miles in length, was constructed in 1891.

Pi'late, Pon'tius, the Roman procurator of Judæa, who, after his most solemn assertions of the innocence of Christ, yielded to the demands of his accusers and gave him up to be crucified. There are quite a number of traditions as to what was the end of Pilate: that he committed suicide; that he was beheaded by Nero; that he embraced Christianity, and in the Ethiopic church he is celebrated as a saint. One tells how his body was thrown into the Tiber, making an overflow; another that the body was carried to Mount Pilatus, and there sunk securely in the deep pool on its top. But here again it made storms arise, and every year the devil, on Good Friday, lifts him out of the pool and places him on the judgment seat, where he washes his hands anew. In the Greek church, Pilate's wife has been canonized as a saint. His era is the first half of the 1st century.

Pile-driver, a machine for driving piles. The ordinary form consists of a heavy iron weight which can be raised vertically from ten to forty feet between upright guides and then be released to fall on the pile beneath. The common weight of the ram is from 1,000 to 2,000 pounds, but weights of 4,000 pounds and over are occasionally used. It is usually lifted by a wire rope, which is wound up on a drum revolved by a small steam engine, the ram being released when the desired height is reached. In the Vulcan-Nasmyth steam pile-driver, a hammer is attached directly to the rod of a piston which works in a vertical steam cylinder. The admission of the steam to the cylinder causes reciprocating hammering, the number and character of the blows

being regulated by an adjustable valve-gear. Another form of pile-driver is the gunpowder pile. In this the explosive force of gunpowder confined in a suitable mortar is used to drive the pile.

Pileus (*pī'le-ŭs*), the spreading cap-like portion of a mushroom or toadstool. See BASIDIOMYCETES.

Pil'grim Fathers, the founders of the first English colony settling in Massachusetts. This colony belonged to a sect of separatists originating in Yorkshire, England, who had, previous to their sailing for the New World, spent some time as exiles for religion's sake in Holland. The company, numbering 100 men, women, and children, set sail from Plymouth, England, Sept. 6, 1620, bound for the banks of the Hudson. But after a long and stormy voyage, they were driven on the bleak and desolate shores of Cape Cod. They landed Dec. 21, 1620, at a place to which they gave the name of Plymouth. A monument to their memory has been erected there. Before landing they drew up and signed a compact of government, which is regarded as the first written constitution we have an historical account of.

Pil'lory, an instrument for the public exposure and punishment of criminals. It consisted of a post and frame fixed on a platform. In the frame, which is attached to the post after the manner of a sign-board, are three holes through which the hands and head of the criminal are thrust, and out of which he cannot draw them. Thus standing behind the frame he faces the gazing crowd. The exposure was a chief part of the punishment. It was at one time customary to shave the head wholly or partially.

In the laws of Edmund I. it was required to so construct the pillory as not to put the body "into peril." In the earliest pillory punishments, they seem to have been confined to offenses not amounting to felony, called misdemeanors, such as using deceitful measures and weights, libel, seditious writings, etc. Later on, common scolds, brawlers, and others were punished in this way. In the 17th and 18th centuries, it came to be used for the punishment of political offenders. It was abolished altogether in Britain in 1837.

Pil'low, Gid'eon John'son, an American soldier, was born in Williamson county, Tenn., June 8, 1806. He graduated at the University of Nashville in 1827, and not long after was admitted to the bar. He served as a delegate to the Democratic convention which nominated James K. Polk to the presidency. During the Mexican war he was appointed a brigadier-general of volunteers. He commanded the right wing at the battle of Cerro Gordo, where he was wounded. Being promoted for gallantry, he took part in the battles of Molino del Rey and Chapultepec, where he was again and more severely wounded. He practiced law in his own state until the beginning of the Civil war, to avert which he had proposed various compromises. But having entered the Confederate service in 1861, he was rapidly advanced to the command of a brigade, and he took part in the battles of Belmont and Fort Donnelson. He was second in command when the latter was taken by the Federal troops, but made his escape. He afterward served under General Beauregard in the southwest. He died in Lee county, Ark., Oct. 8, 1878.

Pi'lot, a person deputed to take charge of the course of a ship through a particular sea reach, or dangerous channel, or out of, or into port. He "stands at the wheel" we say. He must know how to manipulate the rudder and must be familiar with the channel. A steamboat neglecting to have a duly licensed pilot for a given port or reach would forfeit its insurance in case of an accident.

Pinck'ney, Charles Cotes'worth, an American statesman, was born at Charleston, S. C., Feb. 25, 1746. He took part in the earliest movements of the revolution of 1776. In the war which was then brought on, he did noble and conspicuous service. He was Washington's aid-de-camp at Brandywine and Germantown. He saw much active service until 1780, when he was taken prisoner at the surrender of Charleston. A member of the convention that framed the constitution of the United States, he introduced the clause forbidding religious tests of qualification for office. In 1796, he was sent as minister to France, but the Directory refused to receive him, and he had to quit the country. War between France and the United States was at the time threatening. The French intimated to Pinckney and his associates that a gift of money from the United States would avert war. Then Pinckney burst out in the famous utterance: "War be it then; millions for defense, but not a cent for tribute." He was thrice an unsuccessful candidate for the presidency. He died at Charleston, S. C., Aug. 16, 1825.

Pin'dar, the chief lyric poet of Greece, was born about 522 B. C. near Thebes, and died at Argos 443 B. C. He began his career as a writer of choral odes at the early age of twenty years, and soon reaching the highest rank of his profession, composed odes for persons in all parts of the world. Wherever he went he was honored and loved for his own sake as well as for his art. States vied with each other in doing him honor. Though a frequenter of princely houses and kings' palaces, he never lost his manly independence. In his poems he gives advice and reproof as well as praise to his patrons. He warns the great Hiero of Syracuse to avoid flatterers, and cautions one ruler against severity. Two conquerors of Thebes, Pausanias, the Spartan, during the Peloponnesian war, and later Alexander the Great, left no other dwelling

in Thebes standing than the house in which Pindar had lived. Of most of his poems we have fragments only. The *Triumphal Odes*, celebrating triumphs in the Olympian, Pythian, Nemean, and Isthmian games, are entire. A victory won either in the chariot race, for prowess in wrestling, or for skill in music, was held to confer honor not only on the winner and his family, but also on his city, and received a "solemn celebration." Pindar treats the victory not as a mere incident, but as connected with the victor's whole life and history. He loves to dwell on the *moral* side of it not merely on the bodily prowess, but on the temperance, love to parents, or piety, which secured the favor of the gods who granted success. Of myths relating things unworthy of the gods, he says: "I cannot think this way of the divine beings." The groundwork of his poetry consists in the legends which form the Greek religious literature.

Pine, species of the genus *Pinus*, the largest genus of the Conifers, and distributed throughout north temperate regions. They are exceedingly important forest trees, and are developed in a most magnificent way in the western mountain regions. The commonest species in the eastern United States are *P. Strobus*, the white pine; *P. resinosa*, the red pine; and *P. palustris*, the long-leaved or Georgia pine. In the western mountain regions *P. ponderosa*, the great yellow pine, is one of the most important lumber trees. *P. edulis*, the pifion or nut pine, occurs in southern Colorado and southward. One of the most important pines in cultivation is the Scotch pine, *P. silvestris*, the common pine of northern Europe. The Austrian pine, *P. Austriaca* (*P. Laricio*), is a fast growing and massive tree, and common in cultivation.

Pine and Pine Lum'bering in the United States. The pine is a tree belonging to the gymnospermous trees, of the family of *Pinaclæ* and the order *Coniferæ*. It has narrow, angular two or three-edged leaves in bunches of two to five, inclosed in a sheath of membranous scales. One western species has a single rounded leaf in this sheath. There are upward of twenty varieties of pine in the United States, of which fourteen varieties are without much commercial value. Of the remaining the white pine is of greatest value, being straight-grained, easily worked, free from pitch, and, where properly cared for, exceedingly durable. It originally spread in one great forest from Maine through all the northern and upper-lake states; reaching, however, its greatest perfection in Michigan, Wisconsin, and Minnesota. These forests were composed of trees from 75 to 150 feet in height, and from 10 to 11 feet in girth. The red, Canadian, or Norway pine, comes next in value, seldom reaching the dimensions of the best white pines, but reaching, nevertheless, respectable proportions. Its wood is heavy, resinous, and difficult to work. The yellow pine is the most important in the southern states, and is sometimes known as the Georgia pine. Its wood is a dark yellow or orange color. It is hard, heavy, and tough. The long-leaved variety is much sought after for shipbuilding. The Oregon pine or Douglas fir, of the northern Pacific coast, is commercially of great importance, sometimes reaching a height of three hundred feet. The cut of white pines has been so enormous and relentless since the settlement of the country that it is estimated, if the present average of 7,000,000,000 feet of white-pine timber be cut every year and 2,465,368,600 shingles be annually made, the supply will be exhausted in a decade of years. The lumbering interests are drawing more heavily each year upon the forests of the west and south, the improvements in machinery enabling men to use woods which it was impossible to work by hand. The redwood of California, the Douglas fir of Oregon, and the yellow pine of the southwest, are being brought into the market in increasing bulk each year. Thus alone can what remains of our white pine forests be saved from rapid and total extinction.

Pine Bluff, county seat of Jefferson county, Ark., is built on a high bluff on the south bank of the Arkansas river, about 120 miles from its mouth. It lies 38 miles southeast of Little Rock city. It contains iron works, manufactures cotton-seed oil, flour, bricks, and lumber, and ships large quantities of cotton. Population 11,496.

Pine'apple, the fruit of *Ananas sativa*, a member of the *Bromelia* family. It is native to tropical America and has become naturalized in the tropical regions of Asia and Africa. The chief regions of "pine growing," as it is called, which supply the markets of the United States, are southern Florida and the various West Indian islands, the Isle of Pines being named from this industry. The so-called fruit consists of a fleshy cone-like flower cluster which includes the axis and bracts and flowers of a whole inflorescence. Numerous cultivated forms have been developed.

Pink, the name of a species of the genus *Dianthus*, and extended to the members of the pink family. The common pinks of old gardens are supposed to have descended from *D. plumarius*, a native of eastern Europe. The "sweet William" or "bunch pink" is *D. barbatus*, abundant in all country gardens and a native of Europe. The "carnation" or "clove pink" is *D. caryophyllus*, which occurs in a great variety of colors, either pure or variegated, and is grown mostly indoors. Some of the wild flowers which belong to this family are also called pinks, as for example, the "fire pink" (*Silene Virginiana*), which occurs in woods in early spring, and is conspicuous on account of its crimson red petals.

Pins. These simple articles, almost a symbol for a thing of the smallest value, are not only useful, but a prime necessity, yet they did not come into use without the help of art and inventive genius. The earliest kind of pins were probably thorns, or small bones of fish or other animals. Later on, there were pins made of brass, copper, and iron. These were of various forms, and often with gold and ornamental heads. Modern solid-headed pins are made on a machine that was patented by an American named Wright, in 1824. The process is as follows: First, wire of suitable sizes is manufactured, mostly of brass, but iron and steel are also used. When reeled, the wire is ready for use. A pair of pinchers, worked by a machine, draws from a reel of wire a length sufficient to make a pin; its head, which is at the same time made, is straightened by passing through studs. The pin length is seized by jaws from which a portion of the wire, of which the head is to be made, projects and is exposed to blows from a die hammer. The pin is then pushed forward twice, at each time receiving a blow from the die hammer. The wire is then cut to the length of the pin. The headed blanks drop into a slot formed by two inclined and beveled-edged bars. The opening between the bars is just large enough to prevent the heads of the pins from falling through, so that the blanks become sustained in a row along the slot. They are then caught between two parts of the machine, which causes them to rotate, and are thus passed in front of the cylinder which acts like a file and points the pins. As many as 160 a minute can be turned out by a single machine. The pins are cleaned of grease and other matter by boiling them in weak beer. They are next coated in tin, and are then brightened by shaking them in a bag or barrel with bran or sawdust. They are papered by machinery, which is as ingenious as the way by which they are made.

Pipe'fish, a long slender fish with a straight tubular snout, like a pipestem. It is common on the Atlantic coast from Newfoundland south. The male has a brood pouch under the tail, in which the eggs are developed and the young protected for some time after they are hatched. Several other species are found in different seas.

Piq'ua, O., a city of Miami county, on the Miami river and the Miami and Erie canal, in a rich agricultural section, 27 miles north of Dayton, and 72 miles west of Columbus. It is served by the Pittsburg, Cincinnati, and St. Louis, and the Cincinnati and Michigan railroads. It has good water-power from the Miami. Its industries include large linseed-oil works, strawboard, hosiery and woolen mills, furniture, carriage, and stove works, tin-plate and bent-wood works, etc. It has some good schools, and a number of churches, banks, and a public library. Population 12,172.

Pi'racy is robbery on the high seas, and although considered a crime at the present time by all nations, formerly the sea rover was as much a pirate as a trader. Thus the Phœnicians combined piracy with lawful seafaring enterprise. In the days of Homer, piracy was considered a respectable, even a dignified, calling, and the Greeks had a natural genius for it. Cilicia was long the headquarters for Mediterranean piracy, until in 67 B. C. Pompey made his memorable expedition against the pirates with great naval and military forces. The Norse vikings were the terror of western coasts and waters from the 8th to the 11th centuries. The Hanseatic league was formed for mutual defense against the Baltic and other pirates. Later, the Moslem rovers scourged the Mediterranean commingling naval war on a large scale with peddling, thieving, and stealing slaves. Algiers was a stronghold of pirates till well into the 19th century, and in the 17th century the English channel swarmed with corsairs, Algerine pirates. In 1635, they actually entered Cork harbor, and carried off a boat with eight fishermen, to be sold as slaves in Algiers. The buccaneers preyed mainly on the Spanish commerce with the Spanish-American colonies. Captain Kidd, who was sent out against pirates in 1696 by a private company in London, was found to be playing the game of pirate himself, was arrested and tried for piracy and murder, found guilty and hanged May 23, 1701. The original of Scott's "Pirate" was John Gow, who, though bold and successful under the guise of friendship, was proved to be a great villain, and with nine of his men was executed. So late as 1864 five men were hanged in London for murder and piracy. The African slave trade was not considered piracy by the law of nations, though the United States and Great Britain declared it to be so by statute, and after 1841 Austria, Prussia, and Russia made the same declaration. The home of professional piracy is now confined to the Malay peninsula.

Piræus (*pī-rē'us*), the harbor of Athens, Greece; Athens being about five miles from the sea. As far back as the time of Pericles, long walls joined the port with Athens. These were built for protection, so that between them travel to and from the port and the city would be undisturbed. A few traces of the wall remain. The fortification being destroyed by Sulla 86 B. C., the town fell into decay. Since 1834, the modern town has grown up, for more than half the export trade of Greece passes through the port of Piræus. It has a large trade. Population 42,169.

Pisa (*pē'zȧ*), one of the oldest cities of Italy, and once the rival of Venice and Genoa. It still has standing walls and a citadel, and is situated on the river Arno, 50 miles west of Florence and 13 miles northeast of Leghorn, to which place its once prosperous

commerce has been almost wholly transferred. It is still a city of fine buildings, foremost among which is the cathedral, built in the 11th century, with a noble dome, fine paintings by Cimabue, Andrea del Sarto, and others, and beautiful marble altars. In shape it is a Latin cross, 311 feet long, by 252 wide; the nave is 109 feet high. Outside it has a magnificent façade of four rows of pilasters and arches, and fine bronze doors by Giovanni de Bologna and others. Near by stands the "Leaning Tower of Pisa," which is a splendid specimen of the southern Romanesque architecture, but is peculiar in that it deviates about 14 feet from the perpendicular. This is not due to original design. The tower seems to have begun to heel over to one side when the third story was completed; the architects deliberately accepted the conditions and adhered to the inclining position, but diminished the slope of the upper stories so as to keep the center of gravity well within the walls. The tower is 180 feet in height, consists of eight stories, divided by rows of columns, the last, which contains the bells, being smaller in diameter than the others. The tower was built in 1174 and succeeding years, but the eighth story was not completed until the middle of the 14th century. The marble baptistry or church of St. John (1152–1278), opposite the cathedral, is circular, and supports a dome crowned with a cupola. The interior, noted for its wonderful echo, contains the elaborate pulpit of Niccola Pisana. Pisa contains numerous other churches, some of great age, and many fine palaces, a university, which dates from 1338, with fine library of 150,000 volumes, natural history museum, botanical garden, 1,087 students and 56 lecturers. Many distinguished Italians were born here. Among them Galileo, Giovanni, Pisano, Leonardo the mathematician, and two popes, Eugenius III. and Nicholas V.

Ancient Pisa was an Etruscan city, which became subject to Rome in the 2d century B. C. Early in the 11th century, Pisa had developed into a powerful republic, possessing a formidable fleet and much territory along the Tyrrhenian sea. Throughout the 11th century, Pisa was at the height of its prosperity, and the splendid monuments of art still adorning it belong to this period. In the succeeding conflicts between the Guelphs and the Ghibellines, Pisa lost and gained until in 1284 the Pisan fleet was crushed at Meloria by the Guelphs, headed by Florence and Genoa. From this time, Pisa, having to surrender much territory, declined steadily, until in the middle of the 16th century it had less than 8,600 inhabitants. Population of modern Pisa 66,567. The industries are now confined to silks, cottons, ribbons, and the working of coral and alabaster.

Pisidia (*pi-sid'i-ă*), in ancient geography, was a country in Asia Minor, north of Pamphylia, which separated it from the Mediterranean, and south of Phrygia. It was a rugged and mountainous district comprising some of the loftiest portions of the great range of the Taurus mountains. The rivers are the Cestrus and Eurymedon, and it has in its northern part a fresh-water lake, about 30 miles long. In early times it was occupied by wild, lawless races of mountaineers, who were never entirely subjugated by the various powers ruling Asia Minor at different times. The first mention of Pisidians in history occurs in the *Anabasis* of Xenophon. Later, they resisted the march of Alexander the Great through their country. In Strabo's time they had passed quietly under the Roman power. Pisidia once contained considerable towns, the ruins of which have been brought to light recently by Arundell, Hamilton, and Daniell. The most remarkable ruins are those of Termessus, Cremna, Sagalussus, Sedge, a large and wealthy city in Strabo's time, and Antioch, which Paul visited.

Pisistratus (*pi-sis'tra-tus*), a tyrant of Athens, was born 605 B. C. He was at first in sympathy with Solon, the great Athenian lawgiver, but afterward he came out as leader of one of the parties into which Attica was divided. The one he joined was composed chiefly of the laboring population, anxious for political privileges. He came into the market place with self-inflicted wounds, calling upon the people to protect him from his enemies. A motion to give him fifty men for a body-guard was carried against the strong opposition of Solon. This guard he gradually increased until he became strong enough to take possession of the Acropolis. The leader of the opposing party fled from the city, but returned five or six years afterward and drove Pisistratus into exile. But supported by Thebes and Argos he was able to retake Athens in a short time. He held power at Athens for sixteen years after this, dying in 527 B. C. In the main he ruled Athens well, enforced the laws of Solon, secured provision for old and disabled soldiers, emptied the city of its poorest citizens by supplying them with seed and cattle, and encouraged literature more than any other Athenian had ever done. To him and to the poets and scholars whom he gathered about him the world owes the first complete edition of Homer.

Pis'til (in plants), a term of somewhat indefinite application, inasmuch as it may consist of one carpel or of several carpels organized together. In the former case the pistil is spoken of as simple, in the latter case as compound. In other words, any organization of carpels which appears as a single organ with one ovary is a pistil. See FLOWER.

PISTIL. (*a*) style; (*b*) stigma; ovary hidden in flower.

Pis'tol. See REVOLVER.

Pit'cairn' Island, a solitary island in the Pacific ocean between Australia and South America, area two square miles. It owes its celebrity to its being the dwelling place of the "Mutineers of the Bounty." The British ship *Bounty* was sent out by the government for the purpose of carrying bread-fruit trees to the West Indies to be transplanted. The ship got to Tahiti a few months too soon for the season for removing the trees; hence the crew became demoralized. A short time after leaving Tahiti, twenty-five of the crew mutinied. The commander, Bligh, with a number of his officers, was set adrift in a launch. He made out to reach the Dutch East Indies. The mutineers at first went back to Tahiti. Six of those who chose to be landed at Tahiti were condemned to death, and three were executed in England (1792). In 1790, nine of these mutineers, with six Tahitian men and a dozen women, on the *Bounty*, sailed to and settled on Pitcairn island. Four years later, the Tahitian men murdered all the Englishmen, save one Alexander Smith, who changed his name to John Adams. Another report is, that the Englishmen and Tahitians murdered each other from time to time. It is certain, "that at the end of ten years John Adams was left alone with eight or nine women and several children, and that from them the present inhabitants (now 126 in number) are descended, the mutineers taking possession of the island in 1790. Adams set about the Christian education of the company. Nothing was known of them till 1808, when the American ship *Topaz*, Captain Folger, discovered them. Not until 1814 did a British vessel touch at the island. In 1831, a British vessel at their own request transferred them to Tahiti. They then numbered 87. They remained there not quite a year, and returned to Pitcairn. In 1839, it was annexed to Britain. In 1856, nearly 200 were transferred to Norfolk island, but a number of them returned. The late Queen Victoria at one time sent them a cabinet organ. The people are virtuous and contented, and choose their own pastor and magistrate.

Pitch. In mechanics, pitch is used to denote the distance between two successive threads on a screw measured along the axis of the screw. In acoustics, pitch is used to denote one of the three distinguishing features of any musical tone. The pitch of a note depends upon the number of vibrations per second which produce this note; and the numerical value of the pitch is the number of vibrations per second, or the *frequency* of the note. See ACOUSTICS.

Pitch, a black resinous substance, is obtained from the tar of coal or of wood by the application of heat at low temperatures, the heat driving out the volatile naphtha or spirit. In the production of pitch, the fire must be withdrawn before the heat of the distilling vessel reaches the point at which coke or carbon will be produced. Pitch is also obtained from natural petroleum, bone tar, and stearine residues. The two last are valued by varnish and turpentine makers. Wood-tar pitch is much used to protect timber from insects and the weather; coal-tar pitch is used in the manufacture of black varnishes for coating iron, and for making lampblack, etc. In Persia, it is prepared from goat and sheep dung. Burgundy pitch, produced in Finland, is a drug much used as a medicine.

Pit'cher Plants, those whose leaves form tubes or urns of various shapes, which contain water, and to which insects are attracted and drowned. The common pitcher plants of the temperate regions are a species of *Sarracenia*, which grow in swampy areas. In the tropics, striking illustrations of pitcher plants are found among the various species of *Nepenthes* and their allies, in which urns of various shapes are developed swinging at the ends of tendrils. See CARNIVOROUS PLANTS.

PITCHER PLANT.

Pith, a term which has both a general and a special application. In the former case, it applies to any loose, spongy tissue in plants. Strictly, however, it means the spongy tissue within the vascular cylinder of gymnosperms and dicotyledons. The tissue is parenchyma (which see), and it is apt to die very early, so that the pith of ordinary experience is a dead and empty mass of cells. The pith of ordinary commercial use is obtained from the elder.

Pit'man, Sir **Isaac,** a British educator, and the father of modern shorthand writing, was born at Trowbridge, Wiltshire county, England, Jan. 4, 1813. He was educated at the Normal college near his home, and became himself the master of a school at Barton-on-Humber in 1832. He published his first studies of the art which was to make him famous, in 1837, in a volume entitled, *Stenographic Shorthand.* A few years later he put forth a second volume, which he called *Phonography, or Writing by Sound.* Such was the general acceptance his system found, that little remains of earlier attempts. In 1843, he founded the Phonetic society, and soon after began the publication of the weekly *Phonetic Journal.* He issued many text-books upon phonography, and his system was introduced into the United States in 1847. He was knighted in 1894, and died Jan. 22, 1897. His brother, Ben Pitman, settled at Cincinnati about 1850, and made that city the headquarters for the publication of works similar to those printed by Isaac in the Old World. His system differs slightly from that of his brother, but essentially they are one.

Pitt, William, earl of Chatham, sometimes styled "Pitt the Elder," one of the greatest English orators and statesmen of the 18th century, was born at Westminster, Nov. 15, 1708. He was educated at Eton and Oxford, and entered parliament in 1735, where he took sides against the king, and led the young Whigs, known as patriots, in opposition to Walpole, then at the head of affairs. Though deprived of his commission, his influence increased rapidly both in and out of the house of commons. Walpole was driven from power in 1742, and though the king hated Pitt, he found it necessary to permit his return to the government service. Some wealthy admirers of Pitt's oratory and patriotism left him large sums of money, and, on the dismissal of Fox, Pitt became secretary of state. While Pitt was in power, success returned to the British arms. French armies were beaten everywhere by Britain and her allies —in India, in Africa, in Canada, on the Rhine—and the few ships left her were driven from almost every sea. But Pitt, the prime mover of all these brilliant victories, found himself compelled to resign on the accession of George III., when the British government adopted a vacillating policy. But he did not cease to take an interest in public affairs. He spoke strongly against the arbitrary and harsh policy of the government toward the American colonies, and warmly urged an amicable settlement of the difficulties. But when, America having entered into treaty with France, it was proposed by the duke of Richmond to remove the ministers, and make peace on any terms, ill though he was, Chatham came down to the house of lords. In a powerful address, he protested against the implied prostration of Britain before the throne of the Bourbons, and declared that war, with whatever issue, would be preferable to the proposed terms of peace. This address secured a majority against the motion, and the war was continued. But it was the orator's last effort, for his physical powers suddenly failed, he fell back into the arms of his friends, and was carried from the house by his son William, who in less than five years was himself prime minister. Chatham died in Kent, May 11, 1778. He was buried in Westminster Abbey, where a statue was erected to his memory. See his *Life*, by F. Thackeray.

WILLIAM PITT.

Pitt, William, the second son of the great earl of Chatham, was born May 28, 1759, in Kent, England, while his father was still in the house of commons, and the man most honored in England. Owing to ill-health he was educated at home, his father carefully superintending his studies, and training him in those lines which would best fit him for a brilliant career in parliament. To this was due that wonderful command of choice and accurate English which Pitt possessed above all the orators of his time. He entered parliament, Jan. 23, 1781, and his first speech made a great impression. Burke said: "He is not a chip of the old block, but the old block itself." A member of the opposition said to Fox: "Pitt will be one of the first men in parliament." To which Fox replied: "He is already the first." Although but twenty-three years of age, and poor, he refused the office of vice-treasurer of Ireland, saying he would accept nothing but a seat in the cabinet, and although this speech caused wide-eyed astonishment at the time, three months later he was in the cabinet as chancellor of the exchequer. A year later, the king, George III., urged him to act as premier and choose his associates, but with rare judgment and self-restraint, Pitt declined the dazzling offer. However, on the speedy fall of the coalition ministry then formed, with Fox and North as joint secretaries of state, the king arbitrarily appointed Pitt chancellor of the exchequer and first lord of the treasury. The best judges in the political world then considered his position hopeless, and foretold for him a briefer ministry than even the last three had been. He was opposed by North, Sheridan, and Burke, who united against him, but his dauntless courage, skill, and firmness won him the battle, and on March 25, 1784, parliament was dissolved and Pitt, only twenty-five years of age, was elected minister. He was one of England's most powerful premiers, and held sway for twenty years. He died at Putney, Jan. 23, 1806, and was buried beside his father in Westminster Abbey. See biography, by Lord Stanhope; and *Pitt*, in the "Twelve English Statesmen" series, by Lord Rosebery.

Pitts'burg, the second city of Pennsylvania in regard to population, wealth, and manufactures, is situated at the junction of the Allegheny and Monongahela rivers, which here form the Ohio. It is about eight miles long and five miles wide at its eastern limit, and covers an area of about twenty-seven and three-fifths square miles. Fort Pitt, the first building erected in the present city of Pittsburg, was begun by the French as Fort Duquesne, in 1753, and was abandoned and destroyed by them during the French and Indian war, and rebuilt, in 1758, by the English under General Forbes. The city was incorporated in 1836, and in 1900 the population was 321,616. Pittsburg is the center of the greatest natural-gas field and petroleum-producing territory in the United States. It

is also surrounded by the most extensive bituminous coal-field yet developed, and is extensively engaged in the manufacture of coke. The making of iron and steel, particularly armor plate, structural steel, and steel rails, is the leading industry. In the manufacture of plate glass, Pittsburg leads the world. Other leading industries are the manufacture of locomotives and steel cars, brass goods, brick, salt, chemicals, paper, and electrical supplies. The facilities for transportation are particularly fine; the Allegheny and Monongahela rivers are each navigable for over one hundred miles, and the Ohio connects the city with the Mississippi and the gulf of Mexico. The Pennsylvania, the Baltimore and Ohio, and the Vanderbilt systems of railways center in Pittsburg. In 1900, the river and railway tonnage exceeded that of any other city in the world. There are two hundred churches, a number of private schools and academies, and eighty-four public schools including three high schools. The public schools enroll 40,197 pupils, and employ 990 teachers. Pittsburg has many fine buildings, the principal ones being the Courthouse, the United States Government building, the Carnegie institute, the union depot, the Lake Erie depot, the Schenley hotel, and the Exposition building. The city is connected with Allegheny, and other suburbs, by seventeen bridges, and has over four hundred miles of streets and boulevards. There are six parks, Schenley park being one of the largest in the United States, and Highland one of the most beautiful.

Pitts'burg, Kans., a city and railroad center in Crawford county, southeastern Kansas, 50 miles east of Independence, and 10 miles south of Girard, the county seat. It is on the Atchison, Topeka, and Santa Fé, the Kansas City, Pittsburg, and Gulf, the Missouri Pacific, and the St. Louis and San Francisco railroads. It has in the vicinity rich coal lands and mineral deposits, coal-mines, zinc-works, etc. There are good schools, churches, banks, and the civic facilities of a growing town. Population 10,112.

Pitts'field, a city of Massachusetts, 150 miles by rail from Boston. Beautifully situated on a plateau, where six lakes around the city give rise to the Housatonic river, it contains a marble courthouse, a handsome athenæum, a women's seminary, and has a fine park near its western border. Among the manufactures are cotton and woolen goods, silk, boots and shoes, etc. Population 21,766.

Pitt'ston, Pa., an old and now growing city, in Luzerne county, on the Susquehanna river, and in the center of the rich anthracite coal region of northeastern Pennsylvania, about midway between Scranton and Wilkesbarre. Its manufactories, which have the advantage of abundant and cheap fuel, include machine shops, planing, knitting, flour, and paper-mills; stove and steel-range works; terra-cotta works, ladies' underwear factory, dye-works, and pressed-brick works. West Pittston, across the river and connected with it, is the chief residential part of the city. Pittston was named after the English statesman, William Pitt, and was settled about 1770. Population 12,556.

Pi'us, the name of nine popes:—

Pius V., originally named Michele Ghislieri, was born of poor parents, at the village of Bosco, near Milan, in the year 1504, and at the age of fourteen entered the Dominican order. His merits were recognized by Pope Paul IV., who appointed him bishop of Sutri and Nepi, in 1556, and cardinal in the following year. Being chosen pope, in 1566, he labored to restore discipline and morality at Rome, prohibited bullfights and other objectionable amusements, and regulated the taverns of the city. He also zealously maintained the inquisition, and sought to suppress heresy with a strong hand wherever it was found. But the most important event of his pontificate was the expedition which he organized, in connection with Spain and Venice, against the Turks, which resulted in the great naval victory of Lepanto, Oct. 7, 1571. He died in the following year, and was canonized by Clement XI., in 1712.

Pius VI., originally named Giovanni Angelo Braschi, was born at Cesena, Italy, Dec. 27, 1717, and on the death of Clement XIII., in the year 1775, he was chosen to the pontificate. His administration was enlightened and judicious, and to him Rome owed many substantial improvements. Soon after his accession, however, he was involved in serious conflict with the Emperor Joseph of Austria and Leopold of Tuscany, by whom he was deprived of a considerable portion of his supremacy. Soon after came the French revolution and the confiscation of all church property in France. The pope launched his thunders, but they were not heeded, and soon the storm burst upon his own head. The murder of the French political agent, Basseville, in a street scuffle at Rome, gave the French directory an excuse for attacking him. In 1797, peace was secured by the treaty of Tolentino; but new causes of contention soon arose, and, in 1798, the French marched upon Rome and took possession of the castle of St. Angelo. Pius was called upon to renounce his temporal sovereignty, and on his refusal to do so was imprisoned and carried to Florence. On the threatened advance of the Austro-Russian army, in the following year, he was transferred to Grenoble, and thence to Valence, on the Rhône, where he died, Aug. 29, 1799.

Pius VII., originally Gregorio Luigi Barnaba, was born at Cesena, Italy, Aug. 14, 1742, and became pope in the year 1800. Rome, which had been occupied by the

French for the past two years, was now restored to the papal authority, and the next year the French troops were withdrawn from the city. In 1804, Napoleon compelled Pius to come to Paris to consecrate him as emperor. He was well received, but in less than six months after his return to Rome, French troops seized Ancona and, finally, in 1809, General Miollis entered Rome and took possession of the castle of St. Angelo. The usurpation was consummated in the following year by a decree annexing Rome and all the papal territory to the French empire. The pope was then removed to Grenoble, thence to Savona, and finally to Fontainebleau, and at the latter place was compelled to sign a concordat recognizing the annexation of the Roman states to the empire. After the downfall of Napoleon, the congress of Vienna restored his territories to him, and May 24, 1814, he re-entered Rome, the remainder of his reign being devoted to wise measures of internal administration. Throughout his life, Pius was a model of gentleness, benevolence, and Christian charity. He died Aug. 20, 1823.

Pius IX., originally Giovanni Maria Mastai Ferretti, was born at Sinigaglia, Italy, May 13, 1792. In 1840, he became a cardinal, and on the death of Gregory XVI., in 1846, was elected to succeed him. He was avowedly the leader of the reform party, and one of his first acts was to grant an amnesty to all prisoners and exiles for political offenses. In March, 1848, he published his scheme for the government of the papal states by means of two chambers, one nominated by the pope and one chosen by the people. But the revolutionary fever of 1848 spread too fast for a reforming pope, and on Nov. 15, his minister, Count Rossi, was murdered in broad daylight. A few days later, the pope himself escaped to Gaeta, a Neapolitan seaport near the Roman frontier, from which place he issued a remonstrance to the various sovereigns of Europe. In April, 1849, a French expedition was sent to Civita Vecchia, and in July General Oudinot took possession of Rome, Pius himself returning and resuming his authority in the following year. After this, his policy was the reverse of what it had been, and he continued to the end of his life an unyielding conservative. In his ecclesiastical policy he was active, and uncompromising is his ultramontanism. By a bull, issued in 1854, he decreed the Immaculate Conception of the Virgin Mary as a doctrine of the church. But the most important event of his pontificate was the Vatican Council, at which bishops from all parts of the world assembled in December, 1869, and continued in session until the month of July, 1870. This council first formally proclaimed the doctrine of the papal infallibility, whenever the head of the church issues a decree on a subject of faith and morals to the universal church. For several years previous to this, the pope's temporal authority had been maintained only by French bayonets, and when the garrison at Rome was withdrawn, on the outbreak of the war with Germany, in 1870, the soldiers of Victor Emmanuel entered Rome, and for the remainder of his days the pope lived a voluntary prisoner within the Vatican, only his spiritual power remaining to him. He had the mortification to see Rome the capital of a united Italy, and Victor Emmanuel enthroned in the Quirinal with the affection of all his subjects. He died at Rome, Feb. 7, 1878, and was succeeded in the popedom by Leo XIII. (born 1810, created pope 1878).

Pizar'ro, Francis'co, the conqueror of Peru, was the illegitimate son of a Spanish colonel of infantry, and was born about the year 1470. He never learned to read and write, but entered the army at an early age and served under the "Great Captain," Gonsolvo di Cordova, in Italy. He was also one of Balboa's party that discovered the Pacific ocean, and soon after this became a resident of the isthmus of Panama, on the Pacific coast. From this point, in connection with another old soldier, named Diego de Almagro, he started on an expedition for the conquest of Peru, in the year 1526. But not being strong enough to land and form a settlement, Almagro was sent back to Panama for re-enforcements, while Pizarro and part of the force remained on an island named Gallo. But the governor of Panama refused to give any further support to the enterprise, and sent two vessels to bring Pizarro and his men back to Panama. The latter refused to return, and, drawing a line on the sand, called upon all the men who wished to remain with him and share in the success of his enterprise to come over to his side. Thirteen men crossed the line, and the others returned to Panama. Soon after this, the governor of Panama was induced to send one vessel to Pizzaro, with which he explored the coast of Peru and collected information concerning the empire of the Incas. He then returned to Panama, and soon afterward proceeded to Spain, where he applied for authority to undertake the conquest of Peru. On July 26, 1529, a commission was given him for his enterprise, with the title of captain-general, while Almagro received the title of marshal. Pizarro sailed from San Lucar on January 19, and from Panama the following year, with three vessels, containing less than 200 men, and about thirty or forty horses. Almagro was to follow with re-enforcements. Landing at Tumbez, the Spaniards commenced the march inland in May, 1532, and in November entered the city of Cajamarca. The Inca Atahualpa, being on his way to Cuzco, the capital of his empire, was treacherously captured and put to death by Pizarro, who first extorted a large sum, equal to several million dollars, for his ransom. Pizarro then marched to Cuzco, and set up the young Inca Manco, as nominal sovereign of the empire,

being careful to retain the real power in his own hands. In 1535, he founded the city of Lima as the capital of his new government. Two or three years later, a fierce quarrel arose between Pizarro and Almagro, the latter claiming that he was the lawful governor of Cuzco, and that he had not received his full share of the honors and riches to which he was entitled. This contest almost assumed the proportions of a civil war, and resulted in Almagro's being captured and beheaded by Pizarro. But Almagro's followers, driven to desperation by the manner in which they were treated by Pizarro, formed a conspiracy against him, and June 26, 1541, he was attacked in his house at Lima while partaking of his midday meal, and assassinated, his body being buried in the cathedral by stealth and at night. Pizarro's name is one of the most prominent in the history of the conquest of the New World. He was able, brave, and resolute, but perfidious and cruel to the last degree. The execution of the Inca Atahualpa is a stain upon his reputation that time will never remove; like the blood on Lady Macbeth's right hand, it is a "damnéd spot" that cannot be washed out.

Plague, a term applied during the middle ages to all fatal epidemics, but now restricted to a contagious fever prevailing at certain times and places epidemically. The general symptoms resemble those of other fevers — shivering, rise of temperature, pain in the head, back, limbs, etc. Bleeding from the lungs, though rare in recent epidemics, was formerly regarded as a characteristic symptom of the "black death" in its most virulent form. About the second or third day the most distinctive features of the disease present themselves, viz., glandular swellings, usually in the neck, armpits, or groins; these generally break and lead to prolonged suppuration. The cause of the epidemic has never been determined. It is certainly very infectious, and the infection may be conveyed by clothes, bedding, etc., as well as by direct contact with the sick. It is also the most destructive of all epidemics. The black death of 1348–50 is believed to have destroyed more than half the population of Europe. The first extensive outbreak of this disease was in the 6th century of our era, and devastated the whole Roman empire. It is supposed to have originated in Lower Egypt; but from this time on frequent epidemics occurred in Europe. The last outbreak in England was in the year 1665, and was called the "Great Plague of London." Nearly 100,000 persons perished in London alone during its ravages. Since the end of the 17th century it has only twice visited western Europe; in 1704–14 it spread from Russia and Hungary as far as Sweden, Denmark, and Bavaria, and in 1720–22, being introduced into Syria from Marseilles, it destroyed almost half the population there, and spread through Provence. The last cases known in Egypt were in 1844, and since that date it has occurred more than once in Arabia, Tripoli, Persia, and Mesopotamia, and in 1878–79 it spread to southeastern Russia.

Plain'field, N. J., an attractive city in Union county on the Central Railroad of New Jersey, 10 miles north of New Brunswick, and 25 miles west of New York city. It has some charming residences and is tastefully laid out. It has a number of good schools and churches, public library, art gallery, the Muhlenberg hospital, and other civic and philanthropic institutions. Its manufactures embrace carpet, oil-cloth, and machine-tools works, together with an establishment for the manufacture of printing-presses. Population 15,369.

Plane'tree, the oriental plane, a native of Greece and the east, was planted by the Greeks and Romans as an ornamental tree, and for centuries the youth of Greece assembled under its shade in the groves of academies to receive lessons in philosophy. It is still planted for shade and ornament in the south of Europe, and there are no finer trees in London than its planetrees. Noble specimens are to be seen in Hyde park and Russell square, and the avenue of the Thames embankment is formed with this tree. In the east the planetree attains a great size. One in the meadow of Buyukdere, on the banks of the Bosphorus, is 140 feet in circumference at the base, and is believed to be 2,000 years old. The North American plane, or buttonwood, is very similar to the oriental plane. It is the largest evergreen tree of the United States, and abounds on the banks of rivers in the middle states.

Plan'ets. If one observes the sky night after night he finds that practically all the stars maintain their relative positions; but there are certain heavenly bodies, besides the sun and moon, which form a striking exception to this general rule. There were five of these bodies known to the ancients who called them "planets" which is merely the Greek word for "wanderers." To these five bodies had been given the names Mercury, Venus, Mars, Jupiter, and Saturn. Copernicus, by placing the sun at the center of the solar system, showed that the Earth also belongs in this same group of bodies. On March 13, 1781, Sir William Herschel discovered what he at first thought was a comet, but which proved, within a year, to be another planet, the one we now call Uranus. On September 23, 1846, an eighth planet, Neptune, was found by Galle at Berlin almost exactly at the point in the heavens where it had been predicted by Leverrier in France, and by Adams in England, a discovery which is justly celebrated as the most brilliant achievement of modern astronomy. Besides these, nearly 500 smaller planets called "asteroids" have been discovered during the 19th century. See ASTEROIDS.

The following table giving the distances and periods of the various planets is taken from Young's *General Astronomy*, p. 295.

NAME.	DISTANCE FROM SUN.	SIDEREAL PERIOD.
Mercury -	0.387	88 days
Venus - -	0.723	224.7 "
Earth - -	1.000	365¼ "
Mars - - -	1.523	687 "
Mean Asteroid -	2.650	3 to 8 years
Jupiter - -	5.202	11.9 years
Saturn - -	9.539	29.5 "
Uranus -	19.183	84.0 "
Neptune -	30.054	164.8 "

It will be observed that the distance from the sun is given in terms of the distance of the earth as a unit. The relative sizes of the planets and the sun are well shown in the accompanying figure:

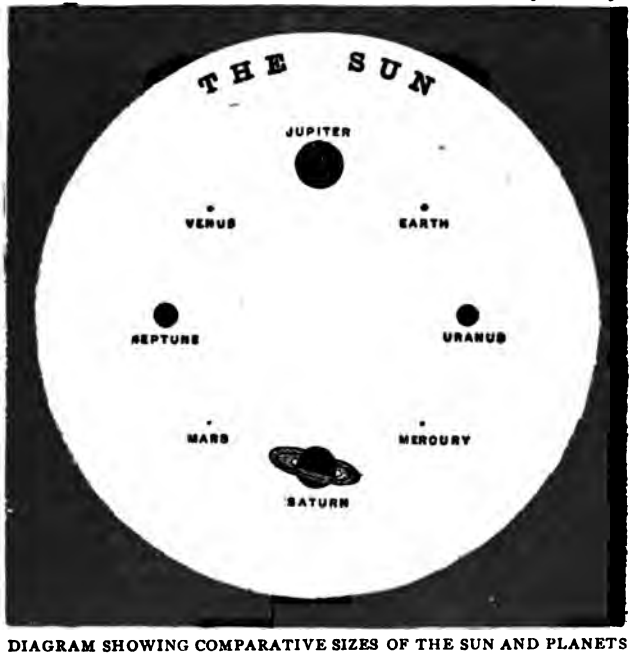


DIAGRAM SHOWING COMPARATIVE SIZES OF THE SUN AND PLANETS

For the laws which describe the motion of the planets about the sun, the reader is referred to the articles *Kepler*, and *Newton*.

Concerning the individual planets it may be noted that—

1. MERCURY, which is nearest the sun, has also the least diameter and the least mass, but the greatest density of all the planets. Its density may be remembered from the fact that it is almost exactly that of the metal mercury, being 12½ times that of water. The diameter of this planet is about 3,000 miles. No satellite has been discovered for Mercury.

2. VENUS has a diameter of 7,700 miles and a density 0.86 that of the Earth, so that in size, surface, gravity, etc., she is not very different from our own planet. No satellite is known.

3. EARTH. See article EARTH.

4. MARS has a diameter of 4,200 miles, and a density which is 0.73 that of the Earth, so that bodies at the surface of Mars weigh only 0.38 what they would at the surface of the Earth.

Two satellites of this planet were discovered by Professor Hall at Washington in August, 1877. These two moons, *Deimos* and *Phobos*, are exceedingly minute, being only 7 and 5 miles, respectively, in diameter. The surface of Mars is covered with interesting markings.

5. ASTEROIDS. See article ASTEROIDS.

6. JUPITER, the largest of all planets, has a diameter of 86,500 miles; and while its density is only one-quarter that of the Earth, its mass is 316 times as great, so that a body on the surface of Jupiter weighs more than twice as much as the same body at the surface of the Earth.

The surface of this planet exhibits some very characteristic markings, especially belts and spots, which lead to the opinion that Jupiter is a body of very high temperature compared with the other planets. He has five satellites, four discovered by Galileo, and one recently (1892) discovered by Barnard at the Lick observatory.

7. SATURN, with its system of rings, is conceded to be one of the most superb objects in the heavens. Although the diameter of the planet is only 73,000 miles, the outer ring is no less than 168,000 miles across. Two rings had been known for a long while, but the third ring was discovered by Bond in 1850. Pierce and Maxwell have proved that these rings are made up of discreet particles, and that the rings, therefore, are neither solid nor liquid. See article MAXWELL. Saturn has eight satellites discovered between the years 1665 and 1848.

8. URANUS, discovered by the elder Herschel, has a diameter of 32,000 miles; but its density is only about one-fifth as great as that of the Earth, so that notwithstanding its enormous bulk, surface gravity there is only 0.90 that of the Earth. It is accompanied by four satellites.

9. NEPTUNE, the most distant member of the family has a diameter of 35,000 miles and a density one-fifth that of the Earth. At an average distance of 2,800 millions of miles from the sun, it is absolutely invisible at the

Earth, except by the aid of a telescope. It has one satellite, discovered almost immediately after the discovery of the planet itself. See Miss Clerke's *History of Astronomy*, and Chambers' *Descriptive and Practical Astronomy.*

Plantag'enet, the name of a family that in 1154, in the person of Henry II., succeeded to the throne of England, on the extinction of the Norman dynasty in the male line, and reigned till 1485, when the battle of Bosworth gave the crown to the house of Tudor. The Plantagenet kings were Henry II., who reigned from 1154 to 1189; Richard I., who reigned from 1189 to 1199; John, from 1199 to 1216; Henry III., from 1216 to 1272; Edward I., from 1272 to 1307; Edward II., from 1307 to 1327; Edward III., from 1327 to 1377; Richard II., from 1377 to 1399; Henry IV., from 1399 to 1413; Henry V., from 1413 to 1422; Henry VI., from 1422 to 1455; Edward IV., from 1455 to 1483; Edward V., who, being a youth of thirteen when his father died in 1483, was placed in the Tower by his uncle, Richard III., and was there supposed to have been murdered by Richard's order; Richard III., who reigned from 1483 to 1485. See articles under these several names, and for the great struggle between the rival branches of the Plantagenets, see ROSES, WARS OF THE.

Plan'tain, species of *Plantago*, a genus containing more than 200 species, which are distributed everywhere, at least twenty plantains being known in North America. They all have a common habit, namely, a a rosette-like cluster of basal leaves from the center of which there rises a stalk bearing the more or less elongated dense spike of inconspicuous flowers. In the common plantain this spike is often said to resemble a rat's tail. By far the most common species is *P. major*, the dooryard plantain, which has received numerous other common names. Perhaps the next commonest form is *P. lanceolata*, known as ribwort, rib grass, and scores of old names.

Plasmo'dium, the naked protoplasmic body of the slime molds. It consists of numerous fused naked cells and has the power of motion, like a huge amœba. See MYXOMYCETES.

Plas'ter of Par'is is a name given to gypsum (*q. v.*) prepared for use in the arts, the name arising from the fact that the most famous beds of gypsum in the world are those of Montmarte, near Paris, and the product is shipped from that city. The plaster itself is merely gypsum, the natural bihydrated calcium sulphate, heated and ground fine. In this condition it constitutes a powder devoid of moisture, which moisture has been driven off by heat. But upon the reapplication of water to the mass it rapidly assumes solid form again. This property renders the material invaluable to the designer who can fill his moulds with the moist, soft mass, and presently take out the same "set" in the form given it by the matrix. Dentists use this material in taking casts of the jaws; decorators use it in ornamenting ceilings and cornices; sculptors use it in making the final model from which the marble statue is copied by skilled workmen who make that a profession.

Platæa (*pla-tē'a*), a city in the western part of Bœotia, on the borders of Attica and at the foot of Mount Cithæron, six miles from Thebes. In the year 480 B. C., it was destroyed by the Persians because the inhabitants had taken part with Athens in the battle of Marathon; but in the following year it was the scene of the victory won by Pausanias and Aristides over the Persians under Mardonius. During the third year of the Peloponnesian war, 429 B. C., it was besieged by a Theban and Spartan force, and heroically defended itself for more than two years until it was starved into surrender, the garrison of 200 men being put to the sword and the city razed to the ground. Such of the Platæans as escaped were hospitably received at Athens, and by the treaty of Antalcidas, forty years later, their children were allowed to go back and rebuild their city; but they were again driven out by the Thebans, and half a century elapsed before the victory of Philip at Chæronea enabled the Platæans finally to return to their homes.

Pla'teau, Joseph Antoine Ferdinand, a distinguished Belgian physicist, was born at Brussels in 1801, and died at Ghent in 1883. He was educated at the University of Liège, and was professor of physics at the University of Ghent from 1835 to 1883. His most important contributions to science are along two rather different lines, viz., subjective visual phenomena and capillarity. It was while engaged in the former study that he looked directly at the midday sun for 20 seconds in order that he might study its after effects. One of these "after effects" was that he became permanently blind in 1843. His work on surface tension was carried on, under his direction, by his wife and son and by his distinguished son-in-law, Van der Mensbrugghe. These researches are contained in his *Statics of Liquids* (1873) which has been translated into English by the Smithsonian institution. A more beautiful and ingenious series of experiments on surface tension than those here described it would be impossible to find. Plateau is to be remembered also as the inventor of the thaumatrope.

Plat'ing consists in covering the surface of a metal with a coating of a more valuable metal. Thus many metals and alloys are plated with gold or silver, and iron is frequently nickel-plated. The operation is performed most frequently by placing the object to be plated in an appropriate solution and causing the metal to be deposited by means of an electric current. In silver plating a

bath of silver cyanide dissolved in potassium cyanide is commonly used, while an anode of silver supplies this metal as fast as it is deposited upon the objects forming the cathode. Copper and zinc may be deposited at the same time upon iron objects, thus producing brass plating. In most cases electro-plated articles require rubbing or "burnishing" in order that they may acquire a brilliant luster.

H. L. WELLS.

Plat'inum is one of the "noble metals." It is generally found in small granules mixed with other metals, but sometimes in masses as large as a pigeon's egg — in rare cases pieces have been found weighing ten or more pounds. It is chiefly obtained from the Ural mountains, although it has also been found in Brazil, Colombia, California, Canada, and Borneo. Platinum is the heaviest form of matter known, except iridium and osmium. It expands less by heat than any other metal, and as it expands to about the same extent as glass, it is easy to fuse a wire of this metal into glass without causing the latter to break subsequently. Electric currents are thus led into the ordinary incandescent light bulbs. On account of its power of resisting the action of acids it is of great service in chemical experiments, platinum capsules, crucibles, etc., being found in every laboratory. Platinum is exceedingly malleable and ductile, but it melts only when subjected to the very highest degree of heat. On this account it is in great demand for electrical as well as chemical apparatus, and the recent introduction of the platinotype process in photography has run up the price from 35 cents per ounce in 1880 to about twice that amount at the present time.

Pla'to, a distinguished Grecian philosopher, was born during the early years of the Peloponnesian war, most probably about 425 B. C. A vast amount of detail has come down to us respecting his life, but most of it is very doubtful. According to one account, Plato was born in Athens; according to another, in the island of Ægina. He came of an aristocratic family, his father, Ariston, boasting descent from Codrus, the last king of Athens. In his youth, Plato indulged to some extent in writing poetry, but when he compared his various compositions with Homer, he abandoned the Muse entirely, and having when about twenty years old become acquainted with Socrates, he henceforth devoted himself to philosophy. His companionship with Socrates continued until the death of the latter, in the year 399 B. C. Plato made no attempt to enter on a political career. His youth was passed amid the disasters and failures of the Athenian democracy, and it is not likely that the martyrdom of his friend and teacher, Socrates, would favorably incline him to the democratic form of government. After the death of Socrates he went to Megara, where he remained some time, and afterward visited Cyrene, Egypt, Italy, and Sicily. Accounts of his visits to the Persians, the Babylonians, and the Hebrews are doubtless fictions of a later age, which supposed that wisdom could only come out of the east. On his way back to Athens, Plato is said to have been seized and sold as a slave in Ægina, but was ransomed by one Anniceris of Cyrene. On his return to Athens, about the year 388 B. C., he began to teach in the academy, a grove in the western suburb of the city, named from the hero Academus. There he gathered around him a band of disciples, teaching them mainly by questions and conversations, after the manner of his master Socrates. He twice visited Sicily, where he spent some time. Returning to Athens, he continued his work of teaching and writing until 347 B. C., when he died at a wedding feast in his eighty-first year.

The distinctive principles of the teaching of Socrates are the "inductive method" and the effort to get general definitions. When people spoke about persons or acts as just or beautiful, Socrates would ask, "What is justice?" "What is beauty?" and would test every definition brought forward by applying it to particular instances, content to remove misconception and error even when complete truth could not be obtained. This is the course pursued by Plato in his earlier dialogues; but in the *Theætetus* the Platonic Socrates asks the profounder question, "What is knowledge?" It is not "sensation," for sensation alone gives us no objective certainty. It is not "opinion," for opinion may or may not be true. A man only knows when he sees the reasons or causes of things; when he perceives facts as links in the chain of cause and effect. Man can only know that he knows when he deals with that which is permanent and universal. What then is this? Plato's answer is found in his theory of "ideas" or "forms." These are not material objects, but the everlasting essences, to be apprehended only by the reason; they are the substances of which material things are but the shadow. In our time they are generally described as "mental concepts." The form of a statue is not the marble out of which it is carved, but the thought or conception of the sculptor, of which the marble is only an expression. In his *Republic*, Plato elaborates his theory of knowledge and gives an illustration of it by picturing a majority of mankind as prisoners in a subterranean cavern chained with their backs to a fire, looking at the shadows thrown by it on the rocky wall and mistaking them for realities. The turning around of these prisoners to the light, their toilsome ascent up the steep slope to the mouth of the cave, the gradual training of their eyes to see the real things in the upper world, and then finally looking up to the sun itself, all this represents the education of the philosopher. Education is turning around the eye of the soul to the light. Learning, according to the *Meno* and *Phædrus*, is

"recollecting"; the soul in a previous existence has beheld the "ideas," or "forms"; and knowledge is possible because the mind does not acquire something alien to it, but recovers what is its own.

Philosophy to Plato was not mere intellectual speculation, but a habit of mind and a manner of living. The highest of the ideas in his view was "the good." While he does not accept the theory that pleasure is the good, neither does he agree with the cynics that all pleasure is evil. Pleasures are good or bad, high or low, according to the part of the soul to which they belong. Plato accepts without proof the popular distinction of four "cardinal virtues" — wisdom, the virtue of reason; courage, the virtue of the spirited element; temperance (*i. e.*, moderation, self-control in general), the virtue of the lower parts in their relation to the higher; and justice, the virtue of the whole soul.

In Plato's *Timæus* the cosmos, or order of the universe, is the "one only begotten image of God," its father and creator. The Creator being good, wished to make the world as nearly like Himself as possible; but no created or visible thing can be perfect. The material out of which the world was formed introduced evil into it. So also the Creator could not make the world eternal like Himself, and He therefore created Time, "the moving image of eternity." See Professor Jowett's translation of Plato. The doctrine of immortality is the main subject of the *Phædo*, and as the soul, according to Plato's philosophy, had an existence before the body, therefore it cannot be affected by the death and dissolution of the body.

Platt, Thomas C., an American business man and politician, famous as a leader of New York Republicans, was born at Owego, N. Y., July 15, 1833, and he has never acquired any other legal residence, although seldom in his birthplace except to vote. He studied at Yale college, but was not able to complete his course there on account of impaired health. He began business in his native village about 1855, but soon after became interested in lumbering in Michigan. The first public office he held was that of clerk of Tioga county. He was elected a member of congress in 1873–77, and United States senator in 1881. He resigned May 16, the same year with Roscoe Conkling. He was returned to the senate in 1897 for a period of six years. Mr. Platt has been actively engaged in many forms of business but has given most time to the affairs of the United States Express Co., of which he is president. He was the recognized leader of Republican political affairs in New York state for many years.

Platt'deutsch, or "Low Dutch," the direct descendant of old Saxon, is spoken to-day in different dialects by the peasantry of North Germany from the Rhine to Pomerania. Low German softens the consonants, but avoids the deep sibilants of high German as spoken in the south, and has simple grammatical rules. It is very appropriate in the mouths of the people who use it, their chief characteristics being a childlike good nature and sturdy honesty. Klaus Groth, Fritz Reuter, and other writers have given it a high literary standing.

Platte (or **Nebras'ka**), a tributary of the Missouri river, is formed by the junction of its north and south forks in western Nebraska. These forks, which rise among the Rocky mountains in Colorado, are 800 and 500 miles long, respectively, and neither of them is navigable. The general direction of the Platte is eastward in a wide, shallow stream over the plains of Nebraska till it reaches the Missouri river, after a winding course of over 400 miles. With its forks it drains some 300,000 square miles of territory, but like them it is not navigable.

Plautus (*plaw'tus*), **Titus Maccius,** the chief comic poet-dramatist of Rome, was born about 250 B. C. in Sarsina, a village in Umbria. We have no positive knowledge as to his early life and education, but it is probable that he came to Rome at an early age and acquired there his mastery of the most idiomatic Latin. At Rome, he found some kind of employment in connection with the stage and made money enough to set up in business for himself in the way of foreign trade. He, however, failed in business and returned to Rome in such poverty that he was compelled to earn his livelihood by turning a handmill, work usually performed by slaves. While engaged in this occupation, he wrote three plays, which proved so successful that from that time he was the favorite dramatist of his day. His plays were very popular, not only with the common people, but also with the educated classes, and were acted in the time of the Emperor Diocletian, five centuries later. The scenes of his comedies are always laid in Athens or in some other Greek town; but his Greek characters speak and act like Romans. Shakespeare himself is not more careless about inconsistencies of this kind. The charm of Plautus lies in his genuine humor and grasp of character. He goes down to the very depths of human nature, and delights his readers to-day as truly as when he made the Roman theatres ring with applause, or when St. Jerome solaced himself in his cell by reading the well-loved comedies. Shakespeare has imitated the plot of the *Menæchimi*, entirely recasting it in his *Comedy of Errors*. He died in 184 B. C. See *Roman Poets of the Republic*, by Sellar.

Play'fair, Lord, formerly known as Sir Lyon Playfair, an English chemist and statesman, was born at Meerut, India, May 21, 1818 but educated at St. Andrews university, Scotland. He early became interested in the study of chemistry, to which he devoted

himself assiduously, going to Germany in 1838 to study under Baron Liebig. He was appointed manager of the great calico-print works at Clitheroe, Lancashire; and in 1844 professor of chemistry in the Royal institution, Manchester. Under Sir Robert Peel he was made commissioner to examine into the sanitary condition of the chief cities of Great Britain. In 1851, he was made special commissioner in charge of the department of juries in the first World's Fair, the exhibition of 1851, being made a Companion of the Bath for services rendered. He had also offices in connection with the expositions of 1862 and 1878 (Paris). He served ten years as professor of chemistry in the University of Edinburgh, and in 1868 he was elected to parliament to serve for both the universities of St. Andrews and Edinburgh, holding a seat at Westminster for seventeen years. He was postmaster-general, deputy speaker of the house, and vice-president of the council at various periods. He was lord-in-waiting to the queen, and counsel to the Prince of Wales. In 1883, he was made a K. C. B. In 1885, he was president of the association for the advancement of science. He was raised to the peerage as Baron Playfair of St. Andrews in 1892. He was the author of various works upon his chosen profession and edited an edition of *Liebig's Chemistry in Its Application to Agriculture and Physiology*. He died at London, May 29, 1898.

Plays. See DRAMA.

Pleas'onton, Alfred, an American general, was born in the District of Columbia in the year 1823, and graduated at West Point in 1844. He served under General Taylor in the Mexican war, gaining the rank of brevet first-lieutenant at the battles of Palo Alto and Resaca de la Palma. After the Mexican war, he continued to serve in the regular army until the Civil war broke out, when he was appointed major of the 2d United States cavalry. He was appointed brigadier-general of volunteers by President Lincoln, July 16, 1862, and as commander of a cavalry division rendered valuable service in the army of the Potomac at Boonsborough, South Mountain, Antietam, Fredericksburg, and Chancellorsville. As chief of cavalry he also took an active part in the engagements with Lee's forces preceding the battle of Gettysburg. The next year (1864) he was transferred to Missouri, where he displayed his accustomed vigor and ability in driving the Confederate forces from the state. He resigned his commission in the regular army in 1868, after which he filled the office of commissioner of internal revenue for several months during General Grant's administration. General Pleasanton afterward resided in Washington city. He died at Washington, D. C., Feb. 17, 1897.

Pleiades (*plē'ya-dēz*), **The,** in Greek mythology, were, according to the most general account, the seven daughters of Atlas and Pleione. According to some accounts, they committed suicide from grief, either at the death of their sisters, the Hyades, or at the fate of Atlas, their father; according to others they were companions of Diana, and being pursued by Orion, were rescued from him by the gods by being translated to the sky; all authorities, however, agree that after their death or translation they were transformed into stars. Their names are Electra, Maia, Taygeta, Alcyone, Calæno, Sterope, and Merope. The group of the Pleiades, called the "Seven Stars," is placed on the shoulders of Taurus, the second sign of the zodiac, and form with the pole star and the twins, Castor and Pollux, the three angular points of a triangle.

Ple'rome (in plants). At the growing tip of a stem or a root the great regions are organized in embryonic form. In both stems and roots there are three such regions. On the outside is "dermatogen" (which see), which gives rise to the epidermis; within the dermatogen is the "periblem" (which see), which gives rise to the cortex; within the periblem and forming the central axis of the stem or root is the "plerome," which gives rise in the mature stem or root to what is known as the "stele," in which the woody bundles arise. A longitudinal section of an ordinary root or dicotyledonous stem will reveal these three great regions. Of course the pith which exists within the woody cylinder of the stem is a part of the stele.

Plin'y the Elder, so called to distinguish him from his nephew of the same name, was born either at Novum Comum (the modern Como), or at Verona, in the year 23 A. D. His education was carried on at Rome under every advantage that wealth could furnish, and at the age of twenty-three he entered the army, serving on the staff of L. Pomponius Secundus, then conducting a campaign in Germany. Returning to Rome, in 52, he practiced at the bar for a short time, and then withdrew to Como, where, during the greater part of the reign of Nero, he devoted himself to reading and authorship. Toward the close of Nero's life he was appointed procurator (collector of revenues) in Spain, and remained there until the year 71, when he returned to Rome to prosecute his studies and to assume the guardianship of his nephew, Pliny the Younger. By incessant and lifelong application he amassed materials enough to fill the 160 volumes of manuscript which he bequeathed to his nephew. His *Historia Naturalis*, in 37 books, is the only one of his works that has come down to us. Under that title the ancients classified everything of natural origin, not only botany, zoology, and mineralogy, but geography and astronomy. Pliny, however, extends this list by comments on human inventions and institutions, and even devotes two books to a history of fine art.

Pliny was in command of the Roman fleet off Misenum when the great eruption of Vesuvius occurred, in 79 A. D. Eager to witness the phenomenon as closely as possible, he landed at Stabiæ, but had not gone far toward the mountain when he was suffocated to death by the stifling vapors and cinders with which he came in contact.

Plin'y the Young'er was born at Novum Comum (Como), Italy, in 62 A. D. His education, after his tenth year, when his father died, was conducted by his mother, his uncle Pliny the Elder, and his tutor Virginius Rufus. He early manifested the highest literary talents, and made such progress that in a few years he was known as one of the most accomplished men of his time. When only eighteen he began to plead in the forum; and at twenty-five, the earliest possible age, he was quæstor Cæsaris, then prætor, and in the year 100 was chosen consul, in which year he wrote his panegyric on the Emperor Trajan. He was twice married, but died without issue, in what year is not known. It is to his letters that Pliny owes his place in literature. An avowed imitator of Cicero, he has caught much of the charm of his model, while his style is hardly, if at all, inferior. We derive from him our impressions of the public and private life of the upper classes in the 1st century; and from his correspondence with Trajan we get our clearest knowledge of the feeling with which even one of the most enlightened Romans regarded the then obscure sect of Christians. Pliny consulted the emperor as to what could be done to stop the spread of what he called "a depraved and extravagant superstition," and in reply Trajan recommended that Christians should not be sought out on suspicion, but that if accused and convicted of holding that faith, they should be punished. Accusations unsupported by proof were not to be received, while suspected persons were to have an opportunity of clearing themselves by offering prayers to the Roman gods. He died in 113 A. D.

Plow, an instrument for breaking up and turning over the soil preparatory to the raising of a crop. The plow is mentioned in the Old Testament as having been used at a very early period; and Dr. E. B. Tylor, in his *Anthropology*, has clearly shown how it arose by gradual improvement from the hoe as that did from the pick or hatchet. The modern plow, with its mouldboard for turning over the soil, was invented in the Netherlands a little more than two centuries since; but it has been greatly improved in that time. England took the lead in this improvement, followed by Scotland, in which country the chief inventors and improvers were Small (the inventor of the Scotch swing plow), Wilkie, Gray, and Sellar. In the American sulky plow the weight of the implement is supported by wheels, thus decreasing friction and enabling the plowman to ride on the plow, instead of walking. The double Michigan plow has a small plow on the beam in front of the other. The small plow pares off the surface of the soil and throws it into the previous furrow, and the large one completely buries it under a heavy furrow slice. Reversible or sidehill plows have the share and mouldboard so they can be easily changed from one side to the other. Steam plowing, although first introduced in England in 1832, is yet in its infancy; but it is reasonable to assume that ere long it will be a very common method of breaking the soil, especially on the prairie land of the United States.

Plover (*plŭv'er*), a shore-bird with long wings and slender legs, related to the snipe. There are about one hundred species of plovers, but only six are found in eastern North America. They live mostly near the water, but some forms visit uplands and dry fields. The killdeer is the one most generally known. It and the piping plover are the only ones that nest in the eastern United States. It is about 10½ inches long, with the upper parts brownish-gray and the tail rusty. The white breast

GOLDEN PLOVER.

is crossed by two dark bands which is its best field mark. The ring-necked plover looks like a small killdeer. It is about 6¾ inches long, with a single black bar across the breast. It visits our shores on its way north in May, and, again, in August and September on its journey south. It is so small it is not shot as game. Besides the two mentioned, those less frequently seen in eastern North America are, the golden, piping, black-breasted, and Wilson's plovers. The lapwing of Europe is a plover.

Plucker (*plŏk'er*) **Tube,** a long slender glass tube, first made by Geissler of Bonn (1858) on the suggestion of Plücker, for the examination of the spectra of gases. The original form of these tubes is shown in the accompanying figure. At each end a platinum

wire is sealed in; and when these wires are connected to the terminals of an induction coil, the electric discharge brings the gas to incandescence, so that its spectrum is then ready for examination by the spectroscope. An improved form of spectrum tube is one in which the capillary portion is placed "end on" instead of "side on" before the slit of the spectroscope. See Kayser's *Handbuch der Spectroscopie*.

PLÜCKER TUBE.

Plum, certain species of the genus *Prunus* to which also belong the peaches and cherries. In the plum the flowers occur in umbel-like clusters and appear either before or with leaves. The fruit is a drupe or stone fruit, as in the case of peaches and cherries. The most common plum of cultivation is *P. domestica*, which is probably of Asiatic origin. Its fruits have been made to vary exceedingly as to shape and flavor. The common wild plum of the United States is *P. Americana*, with dull yellow fruit, splashed with spots of red, which is also under cultivation. The wild goose plum is *P. hortulana*, with many varieties under cultivation. It is found wild in the Mississippi valley.

Plumb, Preston B., United States senator from Kansas, was born in Delaware county, O., Oct. 12, 1837, and removed to Kansas in the year 1856. In 1861, he commenced the practice of law in that state, but the next year was commissioned second lieutenant in the 11th Kansas infantry, in which he rose to the rank of colonel. In 1877, he was elected to the United States senate, and continued an active and useful member of that body until his death, which took place Dec. 20, 1891.

Plumule (*plū'mūl*) (in plants), the first terminal bud which appears in the embryos of most dicotyledons. Sometimes it is very minute, in other cases it contains a number of the early leaves of the plant, and in any case it develops the shoot. See EMBRYO.

Plu'tarch, a prolific author of the first century, was born at Chæronea in Bœotia, in 46 A. D. Scarcely anything is known of his personal history, except that he commenced to study at Athens under the academic philosopher Ammonius in 66, the year of the Emperor Nero's progress through Greece. He also spent several years at Rome, where he enjoyed the friendship of public officers and men of learning, besides devoting himself to a course of study and giving lectures on philosophy. The story that he became Trajan's preceptor and was raised by that emperor to the consulship, is hardly to be credited. Life at Rome not being altogether to his taste he returned to Chæronea, where he became a magistrate, and died at the advanced age of 70 or 75 years, in the reign of the Emperor Hadrian.

The work of Plutarch for which he is most noted is his *Parallel Lives*, in which he gives us the life of some distinguished Greek and some distinguished Roman, and then draws a detailed comparison between them, although some authorities consider these comparisons spurious. These lives, 44 in number, as arranged in pairs, are as follows: 1. Sertorious and Eumenes. 2. Cimon and Lucullus. 3. Lysander and Sulla. 4. Demosthenes and Cicero. 5. Agis and Cleomenes. 6. Pelopidas and Marcellus. 7. Phocion and Cato the Younger. 8. Aristides and Cato the Elder. 9. Pericles and Fabius Maximus. 10. Nicias and Crassus. 11. Dion and Brutus. 12. Timoleon and Æmilius Paulus. 13. Philopœmen and Titus Flaminius. 14. Themistocles and Camillus. 15. Alexander and Cæsar. 16. Agesilaus and Pompey. 17. Pyrrhus and Marius. 18. Solon and Valerius Publicola. 19. Demetrius and Antonius. 20. Alcibiades and Coriolanus. 21. Theseus and Romulus. 22. Lycurgus and Numa. Plutarch was not a profound thinker, but he was a man of rare gifts, and adheres throughout to his professed purpose, which was portraiture of character. For this reason his *Lives* will remain the book of all ages, so that Plutarch may almost be called the interpreter of Greece and Rome to modern times. As a moralist he is a man of practical views and sober judgment — a bright example of the illumination of the intellect by the power of morals. In his style he is picturesque, realistic, and varied, his chief fault being a tendency to diffuseness and redundancy of expression. See Sir Thomas North's version of *Plutarch's Lives*.

Plu'to, the surname of Hades, in Grecian mythology, is the third son of Cronos and Rhea, and the brother of Zeus and Poseidon. To him belongs the sovereignty of the under world — the realm of darkness and ghostly shades — where he sits enthroned as a "subterranean Zeus," and rules the spirits of the dead. His dwelling place, however, is not far from the earth. Pluto is inexorable in disposition, not to be moved by prayers or flatteries, and is borne on a car drawn by four black steeds, whom he guides with golden reins. In Homer, Hades means a person, not a place; and it is to be noticed that the poet does not divide the realm of the shades into two distinct regions. All the souls of the dead — good and bad alike — mingle together. At a later day the kingdom of the dead was divided into Elysium, the abode of the good, and Tartarus, the abode of the wicked. This change also exercised an important influence on the ancients' conception of Pluto. The ruler of the under world not only acquired additional power and majesty, but he was also regarded as a beneficent deity, who held the treasures of the earth (whence his name

Pluto, from *plutein*, "to be rich") in his hands, and who caused the fruits and abundance of the earth to spring from the under ground. Hence in later times men prayed to him before digging for the wealth hid in the bowels of the earth.

Plym'outh, an English seaport on the north shore of Plymouth sound, 240 miles from London and 125 miles from Bristol. Although at the time of the Norman conquest Plymouth was only a fishing village, under the name of Sutton, it has played a leading part in the history of England for several centuries since that time. It was the favorite port of Edward the Black Prince, the chief rendezvous of Drake, Hawkins, Grenville, Raleigh, and their fellows, and the final port of departure of the Pilgrim fathers in the *Mayflower*. In the contest of Charles I. and the parliament, it sided with the latter, and after enduring a series of sieges and blockades, extending over four years, shared with Hull the honor of saving the parliamentary cause. In the reign of James II. it was the first town to declare for the prince of Orange, and in the great French war it rivaled Portsmouth in naval activities. Population 102,000.

Plym'outh, Mass., on Plymouth bay, 37 miles by rail from Boston, is famous as the landing place of the Pilgrim fathers, Dec. 21, 1620. Plymouth Rock, on which they landed, is a granite bowlder at the water's edge and is covered by a handsome granite canopy. The pedestal, on a hill overlooking the landing place, is 46 feet in height, and is surmounted by a central figure of Faith, with four immense stone figures, representing Morality, Education, Freedom, and Law, around the base. In Pilgrim hall are preserved many relics of the first settlement of the country. The town is popular as a summer resort. Population 9,592.

Plym'outh, Pa., a borough on the Susquehanna river, the county seat of Luzerne county, four miles from Wilkesbarre, and in the center of the anthracite coal-mining activities. It is served by the Delaware, Lackawanna, and Western railroad. It has a number of public and high schools, churches, banks, and other civic institutions. Its chief industry is the shipping and handling of coal, as it is in communication, both by water and rail, with Scranton and the mines of Wilkesbarre. Population 13,649.

Plym'outh Sound, on the southwest of Devonshire, England, is a deep inlet of the English channel into which the river Tamar falls from the west, and the river Plym from the east. In 1812, was begun the construction of the Plymouth Breakwater, which is an insulated mole of stones, a mile in length, stretching across the middle of the sound, and thoroughly protecting all vessels anchored within. It was not fully completed till 1841, and cost nearly $7,500,000. Plymouth sound has been said to rival the bay of Naples in beauty. On its western shore is Mount Edgcumbe, the delightful seat of the earl of that name, said by tradition to have been selected by Medina Sidonia as his share of the English spoil. Rame Head, crowned by the ruins of a mediæval chapel, is one of the most picturesque headlands on the coast; and the estuary of the Yealm, with the peaked Mewstone at its mouth, is full of romantic beauty.

Pneumat'ic (*nū-măt' ĭk*) **Tool,** a mechanical tool operated by compressed air. In tunneling and mining, pneumatic drills are used, and similar tools are used for stone carving. The power is applied by pressure of compressed air against a piston, in a cylinder, and by a suitable automatic valve the blow can be repeated several times per minute. Pneumatic riveting machines and hoists are two other pneumatic tools used very extensively. Pneumatic tools are generally simple to operate, but not so economical as either steam or electricity.

Pneumat'ic Tube, a tube or pipe in which packages and written messages are sent by the use of compressed air, or by normal atmospheric pressure acting against a vacuum. The packages are inclosed in carriers of proper shape or size to go into the tube and are forced along the tube by pressure behind them. Pneumatic dispatch is used very extensively in large stores, in connection with "cash systems." In newspaper and telegraph offices it is used to transmit messages. In New York city, London, and several other large cities, it is used to send the mails between the main post office building, the sub-stations, and the railroad stations. In Berlin and several continental cities, it has been used for rapid delivery of local letters in connection with the post office. Lead pipes are ordinarily used for messages, but steel pipes are used for large packages.

Po, the largest river of Italy, rises on Monte Viso, one of the Cottian Alps, at an altitude of 6,000 feet, close to the French frontier. About 60 miles from its mouth, above Ferrara, it begins to form its delta, 60 miles wide from north to south. The delta is rapidly growing in area; Ravenna, once a city on the seashore, is now four miles inland. The entire length of the Po is 360 miles, and it drains an area of 28,900 square miles. It has always been a difficult river to cross on account of its width and the great volume of its waters; hence the commercial importance of such places as Piacenza and Turin, where there are the easiest fords.

Pocahon'tas, daughter of the Indian chief Powhatan, was born about the year 1595. Her name has become famous for the part she is said to have played in saving the life of Captain John Smith in the year 1607. In one of Smith's exploring expeditions in Virginia, he was taken prisoner by the Indian chief Pow-

hatan, and his head laid on a log preparatory to having his brains beaten out by a club. At this juncture, Pocahontas rushed between Smith and her father, and placing her head on that of Smith, persuaded Powhatan to spare his life. Pocahontas married an Englishman named John Rolfe, in 1614, and went to England with her husband two years later. After remaining in that country six or seven months, she embarked for Virginia, and died off Gravesend in March, 1617.

Pod the general name applied to dry and dehiscent fruits. A pod may be made up of one or more carpels. It is also used as the special name of a dry elongated fruit which consists of a single carpel, as in peas and beans. See FRUIT.

Poe (*pō*), **Edgar Allan,** an American poet, was born at Boston, Jan. 19, 1809. His father and mother both dying in his infancy, he was adopted by John Allan, a rich and childless merchant of Richmond. In 1826, he entered the University of Virginia at Charlottesville, but although a brilliant and successful student, he quitted the institution at the end of a year, deeply involved in debt through his passion for gaming. After remaining at home a year or more, he expressed a desire to enter the military profession, and Mr. Allan secured his appointment as a cadet at West Point. Here he drank to excess and so neglected his duties that he was court-martialed and dismissed in the year 1831. He returned to Richmond and was kindly received by his foster-father, who had become a widower and married a second time. It is related that Poe's conduct toward Mrs. Allan was such that he had to be driven from the house. Whether this were the case or not, when Mr. Allan died, in 1834, Poe was not mentioned in his will. Thus thrown upon his own resources for a livelihood, Poe devoted himself to literature. In 1833, the publisher of a Baltimore magazine offered prizes of $100 each for the best poem and the best prose story, both of which were won by Poe. About the same time he secured employment in connection with the *Southern Literary Messenger* at Richmond, and while there married his cousin, Virginia Clem, a beautiful and saintly girl only fourteen years old, who died in 1848. In 1837, Poe moved to New York, where he spent the next few years in various kinds of literary labor, the year 1845 being marked by the appearance of his world-famous poem, *The Raven*. In 1849, he visited Richmond, where it is said he became engaged to a woman of considerable fortune. On the 4th of October he left Richmond for Baltimore, and a few hours after reaching the latter city he was found insensible on the street and taken to a hospital, where he died two or three days later (Oct. 7, 1849). In all the sad records of genius, there is hardly any such dark and disastrous career as that of Poe. Highly gifted as he was in intellect, his moral sense seemed fatally defective. One of his most intimate acquaintances pronounced him, "characterless" and "utterly deficient in high motives." Even his love for his devoted wife could not restrain him from indulgence in the brandy and opium that were working his ruin. There is considerable dispute as to the *degree* of Poe's immorality and degradation of character, and it is certainly to be hoped that some of the pictures drawn of him are greatly exaggerated. But whatever may be said of his morals, his genius must be conceded to be of a high order. Small in quantity and limited in range as is his poetry, there is yet that in it which gives it a high place in American literature, and will cause it to be read and admired by many generations.

Poerio (*po-ā'rē-ō*), **Carlo,** an Italian patriot, was born at Naples, Dec. 10, 1803, his father being a Neapolitan lawyer who had suffered imprisonment and exile in the cause of liberty. He accompanied his father into exile, but on his return became an advocate at Naples. He was frequently imprisoned for his services to the liberal cause; and on the 19th of July, 1849, he was arrested, charged with being a member of a secret society, the Italian Unity, and condemned to imprisonment at hard labor for twenty-four years. With fifteen others, he was confined in one small chamber in the island prison of Nisida. He was afterward moved to other prisons, but was still treated with great rigor and severity. At length, however, there were such protests from other European governments, that Ferdinand II. consented to ship over sixty of his prisoners to America. They persuaded the captain of the vessel to land them at Cork, and Poerio returned by way of London to Turin. There he became a member of parliament, and in 1861 its vice-president. He died at Florence, April 28, 1867.

Po'etry (from the Greek word *poieo*, "to make" or "create"). A complete definition of poetry is impossible, its higher spiritual qualities defying analysis and description. According to the etymology of the word, it signifies a production or creation of any kind; but in actual use it applies to the products of the *imagination* and to the form or language in which they are expressed. Here the critics differ as to whether any composition should be called poetry unless it is constructed in regular measure or meter—that is, whether it must be poetic in form as well as in essence. Certain it is that our literature as well as the literature of other nations abounds in works highly imaginative and composed in truly poetic language, but which are generally called prose works, because their form has not been reduced to meter or rhyme. The book of Ruth in the Old Testament is decidedly poetical in its substance, but prosaic in form, and the same may be said of the book

of Job and the writings of the prophets. But whether we consider rhyme and meter essential to poetry or not, they greatly increase not only its beauty but its effect. The reason of this is that the music of the words so arranged heightens the emotions produced by their meaning, and thus furthers the end that the poet has in view; and so the poet is ever a "maker" as well as a singer. But, on the other hand, neither meter alone nor meter and rhyme combined will constitute poetry, unless there be truly poetic thought clothed in poetic language. The three principal kinds of poetry are the epic, the lyric, and the dramatic. The first of these refers in general to poems that are to be read or recited, not sung. It includes matters of narration, real or fictitious, philosophical reflections, etc. Lyric poetry includes the song in all its varieties, the hymn, the ode, the anthem, the sonnet, etc. Dramatic poetry embraces tragedy and comedy. In actual poetic composition, the distinction between these divisions of poetry is not always clear, as each one of them frequently contains elements belonging to the others.

Pog'gendorff, Johann Christian, an eminent German physicist, was born at Hamburg, Dec. 29, 1796; and died at Berlin, Jan. 2, 1877. He is best known, perhaps, in his capacity as editor of the great German periodical *Annalen der Physik und Chemie*, a position which he held from 1824 until his death in 1877. More than half a century of editorial supervision prepared him in an exceptional manner for the course of lectures which he delivered, in Berlin university, on the history of physics, and which were published in 1879 as a posthumous volume. Poggendorff's contributions to physics were all on electrical subjects. He devised the telescope and scale for reading galvanometers, and besides must be reckoned as one of the inventors of the galvanometer. He devised also an elegant null method for measuring the electromotive force of a voltaic cell.

Point'er. See Dog.

POINTER.

Poi'sons. A poison may be defined as "any substance or matter which, when introduced into the body in any way, can destroy life by its own inherent qualities without acting mechanically." Poisons are sometimes classified according to their source as mineral, vegetable, and animal, or more generally, according to their action as *irritants*, *narcotics*, and *narcotico-irritants*. The irritants, when taken in ordinary doses, produce intense vomiting and purging and severe abdominal pain. They act directly upon the stomach and intestines, which they inflame and frequently corrode. The narcotics act specially on the brain and spinal cord. Among their most common symptoms are headache, giddiness, obscurity of sight, stupor, loss of muscular power, convulsions, and finally complete coma. They have no acrid, burning taste, and except a slight fullness of the cerebral vessels they leave no clearly marked post-mortem appearance. The narcotico-irritants have a mixed action. At varying periods after they have been swallowed, they produce stupor, coma, paralysis, and convulsions, owing to their effect on the brain and spinal marrow. As examples of irritant poisons we may mention sulphuric, nitric, and oxalic acids (in doses of half an ounce or more), carbolic acid, arsenic, corrosive sublimate, blue vitrol, lunar caustic, and chloride of antimony. Among the narcotics are opium, belladonna, alcohol, ether, India hemp, chloral, chloroform, etc. The narcotico-irritants include prussic acid, strychnine, nux vomica, hemlock, aconite, nicotine (the active principle of tobacco), etc. The evils resulting from the use of alcohol in its various forms have caused laws restricting or prohibiting the sale of intoxicating liquors to be passed in most of the states of the Union; and as a preventive of the evils resulting both from alcohol and tobacco, nearly all the states have laws providing for instruction in the public schools as to the effect of narcotics upon the brain and nervous system.

Poi'son Ivy. See Sumac.

Poisson (*pwä-son'*), **Simeon Denis,** an eminent French mathematical physicist, was born at Pithiviers, June 21, 1781; and died at Paris, April 25, 1840. He was educated at the *École Centrale* at Fontainebleau and at the *École Polytechnique* at Paris. It was at the latter institution that he came under the influence of, and soon commanded the attention of, two very powerful teachers, Lagrange and Laplace. In 1802, only four years after entering, he found himself professor of analysis and mechanics in the *École Polytechnique*. In 1812, he was elected to the Academy. Poisson was a staunch Republican and accordingly little in favor with the government during the régime of Napoleon; after the Restoration, however, he was much honored. Among his most important works must be mentioned, in pure mathematics, his contributions to the Calculus of Variations and to the Theory of Probabilities; in astronomy, his proof of the stability of the Solar System; and in physics his very important theorems in

electrostatics, and in fluid motion his theory of capillarity, and his mathematical theory of heat. His treatise on *Mechanics* (2 vols., Paris, 1811) was a standard text-book on this subject for half a century. See Arago's *Notices Biographique*, Vol. 2.

Poitiers (*pwa-tē-ā'*), a city of France, occupying the summit and slopes of a hill at whose base flow the Clain and Boivre rivers. Before the French revolution it had a large number of religious edifices, which even yet are quite numerous. Within and about the city are numerous Roman and Celtic remains, a dolmen, baths, and some fragments of an amphitheatre; and here, in 1882, the remains of an entire Gallo-Roman town were discovered, with temple, baths, and streets spread over fourteen acres. In the vicinity of Poitiers, Alaric II., the Visigoth was defeated and slain by Clovis in 507, and between Poitiers and Tours, Charles Martel won his great victory in the year 732, over the Saracens under Abd-ur-Rahman. Later still, Sept. 19, 1356, about five miles north of the city, Edward the Black Prince, with only 12,000 or 14,000 English and Gascon troops, defeated about 60,000 of the troops of King John of France, killing 11,000 and taking more than 2,000 prisoners. Population of Poitiers, 38,519.

Po'land (called by the natives *Polska*, a word of the same root as *Pole*, "a plain"), a former kingdom of Europe, was, before its partition by Austria, Russia, and Prussia, bounded on the north by the Baltic sea and the Russian provinces of Riga and Pskof; on the east by the Russian provinces of Smolensk, Tchernigoff, Poltava, and Kherson; on the south by Bessarabia, Moldavia, and the Carpathian mountains; on the west by the Prussian provinces of Silesia, Brandenburg, and Pomerania. Its greatest length from north to south was a little more and from east to west a little less than 700 miles, embracing an area of about 280,000 square miles. This extensive tract is crossed by only one range of hills, which rises from the north side of the Carpathian mountains and runs northeast, forming the watershed between the rivers which flow into the Baltic and the Black seas. Much of the soil is rich pasture-land, and considerable is occupied with forests of pine, birch, oak, etc. There is no real Polish history till the reign of Mieczyslaw, 962–992. He became a convert to Christianity, and Poland took her place as one of the political powers, which she continued to hold till the close of the 18th century, when her independence was destroyed and her territory divided between Austria, Russia, and Prussia. The first partition of Poland took place in 1772, when Russia seized 42,000 square miles of her territory, Prussia 13,000, and Austria 27,000. In 1793, after a fruitless resistance to the united forces of Russia and Prussia, Poland suffered another loss of territory, Russia taking possession of 96,000 square miles, and Prussia of 22,000. The Poles now became desperate, and there was a general uprising of the people against the invaders. The Prussians were compelled to retreat to their own country, and the Russians were several times routed. But Austria again engaged in the contest, and fresh Russian troops also arrived. Kosciusko being defeated and taken prisoner at the battle of Maciejowice, the Russians entered Warsaw (1813), and the Polish kingdom came to an end. In the third and last partition of Poland, the remainder of the country was divided as follows: Russia, 49,159 square miles; Prussia, 21,000; Austria, 18,000. King Stanislaus resigned his crown, and died at St. Petersburg in 1798. The main causes of the downfall of Poland, in addition to the greed and selfishness of the European powers, were: 1. The want of union and patriotism among the nobles. 2. The want of a national middle-class, the trade of the country being almost entirely in the hands of the Jews and Germans. 3. The intolerance of the Jesuits. 4. The weakness of the kings. 5. The want of natural frontiers. To-day Poland forms a government department of Russia, embracing ten provinces, and a population of 9,456,000. In 1864, it was deprived of its administrative independence, and in 1868 was incorporated as an integral part of the Czar's dominions; trial by jury was at the same time abolished, and the official use of the Polish tongue prohibited. In this region, there are two main parties, both equally opposed to Russian government, viz., the Nationalists and the Socialists.

Po'lar Bear. See BEAR.

Po'lar Circle. See ARCTIC CIRCLE.

Po'lar Ex'plora'tion. The original motive of the English in exploring the arctic seacoast was to discover a route to the wealthy countries of eastern Asia, and to share in the traffic formerly monopolized by Spain and Portugal. Thus arose attempts both to sail eastward along the north of Europe and Asia, and westward across the Atlantic. Hence arose the terms, "northeast passage," and "northwest passage." Some have traced the history of arctic exploration to the time of King Alfred, but Cabot's discovery of Labrador and Newfoundland, in 1497, may be deemed the first step in the exploration of American polar regions. Frobisher first sailed in 1576, and in 1585–88 the great navigator Davis sailed up the strait bearing his name and coasted the west of Greenland, the "land of desolation." Hudson, who had formerly tried the northeast passage, discovered, in 1610, the great bay and strait that bear his name. From the size of the bay he thought it was a part of the Pacific ocean, but this was disproved by Button, the next English explorer, two years later. After the expedition of Fox and James, in 1631, which led

only to the partial exploration of what was then named Fox channel, the North American coast was neglected for more than a century. In the reign of George III., there was a revival of English zeal in naval adventure and discovery. Captain Phipps (afterward Lord Mulgrave) sailed, in 1773, to Spitzbergen, where the heavy pack ice kept him for nearly a month from proceeding further north. He finally reached 80° north latitude, but Cook, who made the next attempt, could only penetrate to 70°45′. After these failures there was no further effort made until 1806, when Scoresby explored Jan Mayen island and the east coast of Greenland. The famous expedition of Sir John Franklin left England, May 18, 1845, his object being to reach Bering strait from Lancaster sound. In 70° north latitude and 98° west longitude, the ships were beset, and Franklin died in 1847. Among the expeditions sent out in search of Franklin was that of Collinson and McClure, which sailed from Plymouth to Bering strait in 1850. Fixed in the ice on its voyage eastward, McClure's ship was rescued the next spring about 60 miles west of Barrow strait. Belcher now turned toward the Atlantic, and thus McClure reached England in 1854, after traversing the northwest passage from ocean to ocean. He therefore received the honor of knighthood, and the sum of $50,000 was voted by parliament to him and his crew. Several routes are now completely mapped between Davis strait and Bering strait; but the northwest passage has proved of no value whatever for commercial purposes.

The more recent explorations to the north of America have added little to our geographical knowledge, however interesting they may be in certain scientific aspects. The expedition of Kane and Hayes, in 1853–55, reached in sledges Cape Constitution, in 82° north latitude, and saw what appeared to be an open polar sea. In 1871, the *Polaris*, under Captain C. F. Hall, sailed from New London, United States, and reached 82° 16′ north latitude, which was surpassed, in 1876, by the English expedition under Captain Nares. More famous and more disastrous was the "Lady Franklin Bay expedition," of 1881, under Lieutenant Greely. In October, 1883, Greely and his brave companions landed at Cape Sabine, probably the bleakest spot in all the Arctic regions, and there, in June, 1884, Commander Schley found the six men who still survived. In 1869–70, Captain Coldewey's expedition reached 77° north latitude on the east coast of Greenland, the highest latitude yet attained on that coast. The *Jeannette* expedition, under Commander De Long, sent out by the New York *Herald*, in 1879, to push north by Bering strait, ended in disaster, the vessel being crushed in the ice, in June, 1882. The latest expedition to the Arctic regions was that of Lieut. Robert E. Peary, U. S. N., which set out in the *Kite*, June 6, 1891. Reaching McCormick bay, July 24, winter quarters were established there; and the months from August to May were spent by Peary, and a handful of men, in exploring the north of Greenland by an overland journey of over 600 miles on the inland ice, while the *Kite*, commanded by Heilprin, held on its way by sea. In September, 1892, the expedition returned, having determined the northern boundary of Greenland, which is truly an island, not reaching beyond 83° north latitude.

In 1893, R. Knudsen made important corrections in the charts as to the east coast of Greenland, from his personal inspection in the neighborhood of the 68th parallel. Nansen (Fridtjof) crossed the ice-cap of the continent from east to west, in 1888, rising to a height of 9,000 feet upon the divide. Lieutenant Peary, in 1886, advanced fifty miles inland from Disco, on the ice-cap, and made his winter quarters at McCormick bay, about 77° 45′ N., 71° W.; and starting for the further north, May 14, 1892, he reached Navy Cliff, July 4, Independence bay, in 81° 37′ N. In 1895, Peary made an attempt to improve upon this record, but, after reaching Independence bay, he was reduced to such straits for lack of food as to be obliged to abandon the attempt. A noteworthy attempt to reach the pole was made by Captain Nansen, who, having constructed a ship, the *Fram*, after his own designs, permitted it to be frozen into the ice-pack of the Kara sea, in 1893, and with the ice his ship was drifted across the frozen seas which lie about the pole. He had hoped to come out of the ice between Iceland and Spitzbergen; but, the ice-pack not floating so far north as he had supposed, he left the ship and sought to go further on foot. At last he was obliged to turn back; and he reached Franz Josef Land, in 1895, and returned to Norway in 1896. The "furthest north" reached by Nansen was 86° 14′. The Duke of Abruzzi, who sailed from Christiania, June 12, 1899, is reported to have reached a point 19 geographical miles nearer the goal sought. In 1900, Lieutenant Peary sailed with still another expedition, and is still in the frozen seas, report of favorable progress having been received from him in September, 1901. A very fully-equipped expedition sailed from Tromsö, Norway, in command of Lieutenant Evelyn Baldwin, in June 1901.

Few attempts to penetrate the unknown regions of the southern, or antarctic pole, were made after the expeditions of Wilkes, d Urville, and Ross (1839–43), until of recent years. Knowledge of these regions is valuable only from a scientific point of view. But in the summer of 1892, Captain Larsen, of the Norwegian ship *Jason*, discovered, in latitude 64° 10′ S., 57° W., fossils which interested him as showing that the antarctic regions were once covered by coniferous trees. The next year Captain Larsen led an expedition through this region, reaching a point 68° 10′ S. and 60° W. The coasts were high, rocky, and mostly covered with ice. In 1894, Captain Svend

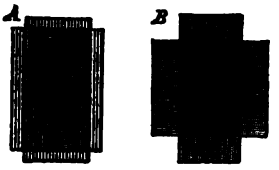
Foyn, in the whaler, *Antarctic*, visiting the southern seas in search of whales, reached a point 74° S.; Jan. 23, 1895, a landing was made at Possession island, where innumerable penguins were found nesting. The first vegetable growth (a lichen) ever found within the antarctic circle, was found both at Cape Adare and Possession island by one of the party, C. E. Borchgrevink, while upon this expedition. Part of the lands supposed by previous explorers to constitute islands, were found to be joined to the main land of the antarctic continent; and land supposed to be islands by the earliest explorers, were found to be surrounded by water. Seven islands were discovered by Captain Larsen in 65° 7′ S., 58° 22′ W., two of them covered with volcanoes.

The general result of all these explorations is that in the north polar regions the unknown has been pushed back to within 80° north latitude, while in the Greenland-Nova Zembla regions exploration has been carried within about 400 miles of the north pole. On the other hand, the south polar region, with the exception of a few patches here and there, is almost a complete blank within the antarctic circle. See *Edinburgh Review*, April, 1891, and *Scribner's Magazine*, January, 1893.

Po'lar Lights. See AURORA BOREALIS.

Polar'ity. This is a term difficult to define, except by examples and illustrations, such as the two poles of the earth, or ends of the axis on which it revolves, and also the north and south poles of a magnet. A globe or sphere not in motion presents the same aspect in every direction; but let it begin to rotate about some diameter, and at once it becomes a polar body. Looked at from one end, it appears to rotate from left to right like the hands of a clock or watch; looked at from the other, it appears to rotate in a counter direction, or from right to left facing. To any one in the northern hemisphere looking toward the equator, the sun and other heavenly bodies appear to move from left to right, but to people of the southern hemisphere, facing the equator, they appear to move in an opposite direction, or from right to left. Thus we see that such terms as up and down, right and left, can be defined only by applying them to the motion or position of some particular object; and the rotation of any object may be used to give us an idea of its polarity. Perhaps the most familiar example of polarity is the magnet. Its polarity is a force polarity, the ends or poles of one magnet having a selective action upon the ends or poles of the other. This particular action is, however, only one among many manifestations of magnetism; and the general tendency among scientists is to explain all magnetic phenomena as essentially *rotational*, the difference in the poles of the magnet being accounted for by the theory of revolving currents of electricity in planes perpendicular to the direction of the magnetic force.

Polariza'tion of Light. In the evidence which is ordinarily adduced for thinking that light consists in a wave-motion of the ether, nothing is said as to whether light vibrations are longitudinal, as is the case with sound, or transversal, as is the case with water waves. The phenomenon which answers this question decisively is the polarization of light.



TOURMALINE PLATES.

The facts are as follows: If we take a thin slice of a tourmaline crystal, cut parallel to its crystallographic axis, and examine the light which passes through it from any ordinary source of illumination, say the sky, we shall find the transmitted light of a greenish, olive color. If now we take a second crystal, exactly like the preceding, and place it upon top of the first crystal, in such a way that the axes of the two pieces are parallel, we shall find the light transmitted as before, only with greater absorption, since it has now to pass through a greater thickness. Suppose, however, that we rotate one crystal upon the other, so that their axes are no longer parallel although their faces remain in contact, we shall find that the second crystal becomes less and less able to transmit the light delivered to it by the first crystal; and when the second crystal has been turned so as to have its axis at right angles to the axis of the first crystal, *no light at all will pass through both crystals*. This latter position is shown in B, Fig. 1; the former position, with axes parallel, is shown at A, Fig. 1. The ray of light is here to be imagined as falling upon the plate of tourmaline in a direction which is perpendicular to the plane of the drawing. Either crystal alone will transmit the original ray however the crystal be placed; but either crystal alone behaves very differently toward a ray which has once passed through a piece of tourmaline. In fact, the passage of the ray through the tourmaline has given it a new property; for it now behaves differently in different azimuths. Such a ray is said to be *polarized*. And the fact that it has different properties on different sides, so to speak, proves that light waves must be transversal. If the disturbance in the ether were "end on," as in the case of sound, it could not possibly make any difference how one rotated the tourmaline through which the light is viewed.

In the early part of the 19th century, it was discovered by Malus that light which has been reflected from any polished surface has this property, which is called polarization, in a greater or less degree; and when reflection

occurs at a definite angle, known as the "angle of polarization," the reflected beam is almost completely polarized. It has been proved by Hertz and Trouton that the vibrations in polarized light are at right angles to the plane of polarization.

Pol'der, in the Netherlands, is land below the level of the sea or the nearest river, which, originally a morass or lake, has been drained and brought under cultivation. An embankment forming a canal high enough to carry the water to the sea or river is made, and apparatus for lifting the water is placed at one or more points. If the lake deepens toward the center, several canals become necessary, formed at different levels as the water surface becomes lessened, a connection being maintained with each other and with the first or outer canal which carries the water to the sea or river. In the Schermer polder, in North Holland, are four canal levels, the land between them forming long parallelograms.

Pole'cat, a carnivorous animal with a long slim body like a weasel. There are four species inhabiting the Northern hemisphere. The common polecat of Europe is dark brown above and black below. Its fur is of little value. They sleep by day, and at night plunder poultry yards and dove-cotes. They feed also on rabbits, rats, mice, and birds. Very similar species are found in Siberia, Thibet, and North America. These animals emit a foul odor when disturbed. The ferret is a domesticated variety of polecat. In the United States, the name is sometimes incorrectly applied to the skunk.

Poles (Greek *polos*, a "turning point"), in geography, are the two extremities of the axis round which the earth revolves, the North Pole being situated 90° north of the equator, and the South Pole 90° south of it. In astronomy, the poles, which for distinction are called "celestial poles," are those points in the heavens to which the earth's axis is directed and round which the heavens seem to revolve. Unfortunately no stars mark the exact position of the celestial poles, and therefore the polestar is used for this purpose, its exact position being determined by noting the point between its upper and lower *culminations*. The term "poles" has also a wider application as denoting the extremities of a line passing through the center of a great circle perpendicular to its plane. Thus we have the poles of the horizon (which are the zenith and the nadir), the poles of the ecliptic, and the poles of a meridian, and in the same sense the terrestrial and celestial poles are spoken of as the poles of the equator and the equinoctial, respectively.

Poles, in physics, denote those points of a body at which its attractive or repulsive force is concentrated.

Pole'star or **Pola'ris,** the star nearest to the North Pole of the celestial equator. The star which at the present time goes under the name of the "polestar" is the star Alpha in the constellation of Ursa Minor. This star is, however, a little more than 1° from the North Pole and has a sensible motion around it. This star will in course of time (about 2,100 A. D.), come within 28′ of the North Pole of the heavens, and will then recede from it. Two thousand years ago the star Beta of Ursa Minor was the polestar, and about 2,300 years before the Christian era the star Alpha in the constellation of the dragon was not more than 10′ from the North Pole, while 12,000 years after the present time the bright star Vega in Lyra will be within 5° of it.

Police (*pō-lēce'*) are an organized force—especially in towns and cities—for the preservation of peace and order, and the prevention of crime. This definition applies more particularly to the police of the United States and of England, as the police of most European countries have much wider functions, and are often used by rulers and ministers for political purposes, and in a more or less oppressive manner. The existing system of police administration in England is of recent origin, and many features of it were introduced during the reign of the late Queen Victoria. In the early periods of English history, there was no such thing as a separate body of police, the responsibility for the maintenance of the peace being imposed on each hundred or tithing, and the individuals composing these divisions being held jointly liable for the consequences of any violations of law which occurred within their limits. In the larger towns, the inhabitants of the various wards kept watch within their limits, special watchmen being gradually introduced; but these duties of watch and ward were performed very inefficiently, and crimes were committed with marked impunity, especially in London and other large cities. During the 18th century, various efforts were made to remedy this state of things in London, and to secure a more efficient administration both in the prevention and detection of crime; but the results obtained were very unsatisfactory. At last, in 1829, Sir Robert Peel organized the Metropolitan police, placing the new force under the control of the secretary of state, and since that time the police of counties and boroughs have been organized upon the same principles as the Metropolitan police, except that they are under the local authority. The strength of this body of Metropolitan police is 15,694, comprising 31 superintendents, 578 inspectors, 1,930 sergeants, and 13,155 constables. The city of London police force numbers 1,002 men, exclusive of those on private service and detective duty. The police force throughout the kingdom is a civil, not a military body, with the exception of the Royal Irish constabulary, which is more military than civil. This force is directly under the Irish government, and its members are armed

and drilled as soldiers. It consists of over 12,000 members under the command of an inspector-general, each county being supervised by a county inspector, and also divided into separate districts over which district inspectors are placed. Below these officers are sergeants and constables, trained in the use of arms and disciplined as soldiers.

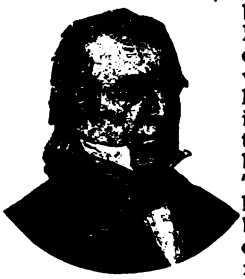
In the United States, each town and city has its separate administration; but, in general, the police system is very much like that of England. The present police organization of New York, which was substituted for the inefficient "night watch" in 1845, may be taken as a type of the American system generally. It consists of a board of police, comprising four commissioners appointed by the mayor, and the police force, who, with their various officers, are appointed by the board. The city is divided into four inspection districts, which are subdivided into thirty-five precincts. At the head of the force is a superintendent, under whom are four inspectors, a captain over each precinct, sergeants, roundsmen (visiting officers), patrolmen (the body of the force), and doormen at the stations. The captains report every morning to the central office. The roundsmen must see that the patrolmen perform their duties, and the sergeants are responsible for both roundsmen and patrolmen. Besides the general force there are several bodies, or "squads," organized for special services. Among these are the sanitary police, the detective force, the harbor police, park police, etc. In the year 1901, the police force of Greater New York numbered 7,444 men, of whom 6,261 were patrolmen, the annual cost of the entire force being $11,938,343. The police force of Chicago — now the second city in the Union — during the same year numbered 3,267, and cost $3,300,432; that of Philadelphia numbered 2,770, and cost $2,725,383; that of St. Louis numbered 1,300, and cost $1,386,500; that of Boston numbered 1,159, and cost $1,500,000; that of Baltimore numbered 880, and cost $900,000; that of San Francisco numbered 589, and cost $840,853.

Polit'ical Econ'omy has various definitions; but there is a general agreement that it is the science relating to the production, distribution, and exchange of wealth. The word is derived from the Greek words *oikos*, "house," and *nomos*, "law or rule"; but in its wider application it refers not only to the laws and institutions of nations in reference to industry and trade, but also to the arrangements of Providence in reference to the supply of man's physical wants. Although economic questions of various kinds occupied the minds of the Greeks and some other ancient nations, and were discussed by their leading thinkers and writers, there was no real science or system of political economy until the time of Adam Smith and his forerunners in the 18th century. Smith's *Wealth of Nations* was the first systematic exposition of the subject by a man thoroughly qualified for his task; and his teaching was defined by himself as a system of natural liberty. He opposed all regulations and restrictions of trade, such as protective tariffs that seem to interfere with the natural order of things, thus following the school of Rousseau, in advocating a return to nature from what he deemed a perverted civilization. He also followed the example of his predecessors, and showed himself in harmony with the new era by making labor the source of wealth. The greatness of Smith's work lies in the fact that he summed up the best thought of preceding times, and that his writings have been made the basis of all subsequent progress in economic science. But great as his influence has been, his ideas have by no means commanded universal or even general acceptance. His system has been variously criticised as being too abstract and merely theoretical; and his followers have been characterized as "students of maxims rather than the markets." The strongest point, perhaps, that is urged against him and his school is that they overlook the importance of the *nation* as the unit in economic growth and development. In answer to Smith's various arguments, it is urged that economic questions must be studied in the light of actual conditions in each state or nation, and that the wise policy can be determined only from a knowledge of all the factors that enter into industry and trade. Great changes have also taken place since Adam Smith's time, which have added new complications to the questions at issue, and have placed the science of political economy in a still more unsettled and unsatisfactory condition. Among these changes the most important is the introduction of machinery, by which individual enterprises have given place to vast corporations and "trusts," thus making the relations between capital and labor one of the leading questions in political economy; and it is urged with great force that the concentrations of capital make such a condition in the industrial world that the various issues between capital and labor cannot be settled by the mere "law of supply and demand," but that moral principles must also be invoked. Hence the relation of political economy to ethics must be considered by students of the science in our time.

In the United States, one of the leading questions in political economy is that of high or low tariff. While individual opinions range from the extreme positions of absolute free trade (that is, the admission of all foreign imports without duty) to tariff rates that would almost prohibit the introduction of foreign products, the two great political parties, Republican and Democratic, may be said to be divided on the question whether tariff duties should be levied on foreign imports for purposes of revenue only, or whether we should also have a "system of protection" under which our

manufactures should be secured against competition with those of England and other countries. This tariff question has been a fruitful theme of discussion by our statesmen and legislators from Washington's administration down to the present time, even to the extent of being made the "leading issue" in several presidential campaigns. See *Wealth of Nations*, by Adam Smith; *Principles of Political Economy*, by J. S. Mill; Clark's *Distribution of Wealth*, and Hobson's *The Economic of Distribution*.

Polk (*pōk*), **James K.**, eleventh President of the United States, was born in Mecklenburg county, N. C., Nov. 2, 1795. He was educated at the University of North Carolina, and after studying law was admitted to the bar at Columbia, Tenn., in 1820. Three years after this, he was chosen a member of the legislature of Tennessee, and in 1825 was elected to congress as the candidate of the Democratic party. In 1835, he was made speaker of the house of representatives, which position he filled with credit and ability. In 1844, he was the Democratic candidate for President against Henry Clay, and was elected by a popular majority of only 38,000, but by an electoral vote of 175 to 105.



JAMES K. POLK.

The principal feature of Polk's administration, which extended from March 4, 1845, to March 4, 1849, was the Mexican war, by which the United States acquired the great states of Texas and California and the territory of New Mexico. Texas was annexed by congress just before Polk's inauguration; and soon after he became President he sent General Taylor with a small force to occupy the disputed territory between the Neuces and Rio Grande rivers, Mexico claiming that this territory never belonged to Texas. In March, 1846, Taylor advanced to the Rio Grande and built Fort Brown, opposite the Mexican port of Matamoras. General Arista, the Mexican commander, then crossed the Rio Grande to attack Taylor, but was defeated at the two battles, Palo Alto and Resaca de la Palma, and forced to recross the river. War was at once declared by congress against Mexico and was prosecuted with energy and vigor until the City of Mexico was occupied by General Scott in September, 1847. During Polk's administration, by a compromise treaty with England, the northern boundary line of Oregon territory — now the state of Washington — was fixed at 49° north latitude. The low tariff act of 1846 was a favorite measure of Polk's, being passed in the senate by the casting vote of Vice-president Dallas. Other features of his administration were the admission of Wisconsin into the Union as a state in 1848; the adoption of the sub-treasury system by which the funds of the government are kept in vaults in Washington instead of being deposited in banks, and the creation of the interior department, its secretary being added to the cabinet of the President. On the expiration of Polk's term, he retired to his home at Nashville, Tenn., where he died a few months afterward, June 15, 1849.

Polk, Leon'idas, general in the Confederate army, and bishop of the Protestant Episcopal church, was born at Raleigh, N. C., April 10, 1806. He graduated at West Point in 1827, and received a commission in the artillery, but resigned and studied for the ministry. In 1838, he was consecrated bishop of Arkansas and Indian Territory, with charge of the dioceses of Alabama, Mississippi, and Louisiana; but in 1841 he resigned all these except the bishopric of Louisiana, which he held until his death, even when commanding a corps in the Confederate army. Soon after the outbreak of the Civil war, Bishop Polk tendered his services to the Confederate government, and was appointed major-general by Jefferson Davis. He commanded an army corps at the battle of Shiloh, and in October following was made lieutenant-general. At the battle of Chickamauga he commanded the right wing of Bragg's army, and being charged by that officer with disobedience of orders, was relieved of his command for a short time, but was afterward restored, and served under Gen. Joseph E. Johnston in Sherman's Atlanta campaign. He was killed by a cannon-shot while reconnoitering on Pine mountain, June 14, 1864.

Poll Tax, a tax levied by the *poll*, or head. In England, the imposition of a graduated poll tax in the time of Richard II. led to Wat Tyler's rebellion in 1381. A similar tax was imposed in 1513, and a tax, varying from 12*d* for a private person to £100 for a duke, was assessed in 1678 and abolished in 1689. In the United States, there is in some states a poll tax, varying from $1 to $3, while in others the imposition of such a tax is expressly forbidden by the state constitution.

Pol'len, the name by which the microspores of seed-plants are most commonly known. Pollen is developed within pollen-sacs, which occur on the anthers of stamens. Each pollen grain is an asexual spore, consisting of a single cell, which has an outer heavy and more or less modified wall, known as the "exine," and a delicate inner wall, known as the "intine." Pollen grains are often variously marked, sculptured, and even winged, by the modifications of the exine. Certain pollen grains, as those of the mallows, are covered with conspicuous spiny points, and this family may be recognized by its pollen.

Pollen has often been mistaken as the equivalent of a male cell, being spoken of as "the male element." It should be distinctly understood that pollen grains are microspores, and that microspores are asexual spores. When the pollen germinates, as other spores do, it produces a male gametophyte, as do all microspores. It is in connection with this new plantlet or male gametophyte that the sperms are developed. See POLLINATION.

Pollina'tion, the transfer of the pollen of plants from the stamen which produces it to the stigma which is prepared to receive it. Pollination is frequently confused with fertilization. Fertilization is the union of the male cell and egg, which may or may not follow pollination. In general this transfer of pollen is effected by one of two agents, the wind or insects. The plants which use wind as a carrier of pollen are called "anemophilous" plants; those which use insects for this purpose are called "entomophilous." The gymnosperms and many of the more primitive angiosperms, such as grasses and many of the common trees, are anemophilous. The great majority of angiosperms are entomophilous, and their flowers have been modified in every way to be adapted to insect visits, and the insects have been variously adapted to flowers. For anemophilous pollination, see GYMNOSPERMS. Entomophilous pollination is of two kinds; namely "self pollination," in which the pollen is transferred to the stigma of its own flower; and "cross pollination," in which the pollen is transferred to the stigma of some other flower. In the case of cross pollination the two flowers concerned may be upon the same plant, or upon different plants which may be quite distant from one another. The advantage of this relation to the insects is to secure food. This the flower provides either in the form of nectar or pollen, and the insects which pollinate flowers may be roughly divided into the two groups of nectar-feeding insects, represented by butterflies and moths, and the pollen-feeding insects, represented by bees, wasps, etc. The presence of these food supplies is made known to the insect by odor, form, and perhaps color of flowers. Those insects which are suitable for this work are necessarily flying forms, as creeping insects would brush off the pollen from their bodies in passing from one flower to another. Plants have many devices by which the unsuitable creeping insects, such as ants, may be warded off. Just what the advantage of cross pollination over self pollination may be is not very clear, but that it is of very great advantage is evident from the fact that the angiosperms have made most elaborate attempts to secure it. In most insect-pollinating flowers there are three problems: (1) to hinder self pollination; (2) to secure the visits of suitable insects; and (3) to ward off the visits of unsuitable insects. Most of the insect-pollinating flowers may fall into three great divisions on the basis of the methods they use to hinder self pollination. The first division includes those flowers in which the pollen and stigma are so related to each other in position that the pollen is not likely to fall upon the stigma. This method results in much of the irregularity of flowers, and conspicuous among these forms are the sweet peas, irises, and orchids. The story of cross pollination in orchids has been told by Darwin in a wonderfully interesting book. The second division includes those flowers in which self pollination is not prevented by the relative positions of the parts, but by the fact that the pollen and stigma are not ready at the same time. When the stigma is ready to receive, the pollen may not be ready for shedding; or when the pollen is ready for shedding, the stigma may not be ready to receive. These are the so-called dichogamous flowers (which see). It is evident that there may be two groups upon this basis; namely, those flowers in which the pollen is ready first, and those flowers in which the stigma is ready first. The former are called "protandrous flowers," the latter "protogynous flowers." The third division includes those flowers in which there are at least two forms, and the two forms are different from one another in the relative lengths of their stamens and styles, and also in the nature of their pollen. For example, in the common Houstonia, a small tubular flower, one kind of flower has the stamens included in the tube and the stigmas protruding; while the other kind has the stigmas included in the tube and the stamens protruding. Each kind of pollen is most effective upon the stigma of the same level. Accordingly, as an insect passes from one such flower to another, crowding its way into the tube, its thorax is likely to receive a band of pollen from the short stamens, and its abdomen another band from the long stamens. In this way the pollen from the thorax is rubbed upon the included stigmas and the pollen from the abdomen is rubbed upon the protruding stigmas. The whole story of the relation between insects and flowers is an exceedingly intricate one and full of surprises. JOHN M. COULTER.

Pollin'ium (in plants). In certain families, notably the milkweed and orchid families, all of the pollen grains formed within a pollen sac stick together in a mass, which is removed bodily by insects. These masses of sticky pollen are known as pollinia.

Po'lo, an equestrian game, which may be briefly described as hockey on horseback. An oblong space is marked out, the usual size of which is 300 by 200 yards; at each end in the center of the line two poles are fixed, 20 or 22 feet apart, forming the goals through which it is the object of the opposing sides to strike the ball. The players are mounted on ponies,

the size of which should not exceed 14 hands, and each player is armed with a polo stick, consisting of a strong cane about four feet long, with a crosshead about eight inches in length, with which to strike the ball of light wood. The proper number of players is four to a side, and in polo, as in most other games, combination is the first condition of success. The ponies need to be carefully trained, and they sometimes become very clever in understanding what is required of them. To become a good player requires a quick eye, good horsemanship, and a great deal of practice.

Po'lo, Marco, the greatest of mediæval travelers, was born at Venice about the year 1254. His father Nicolo Polo, and his uncle Maffeo Polo, about the time of his birth set out on a mercantile expedition, visiting Constantinople, the Crimea, and the court of Barka Khan at Sarai, and from thence proceeded to Persia and to the court of the great Kublai Khan at Cathay. Kublai heard their reports concerning the countries of Europe with great interest, and commissioned them as envoys to the pope. After an absence of nearly twenty years they reached Venice, in 1269, and two years later set out on another trip, taking young Marco with them, and arriving at the residence of Kublai Khan in the year 1275. Their second reception was even more cordial than the first, Kublai taking a decided fancy to young Marco, from the rapidity with which he learned the language and customs of the Mongols. The Polos did not return to Venice until the year 1295, when they were hardly recognized by any of their former friends and acquaintances, on account of their Tartar dress, and the imperfect manner in which they spoke their native tongue; but when their identity was fully established they were treated with great honor and distinction. In 1298, Marco was in command of a galley in the battle of Curzola, and was taken a prisoner to Genoa, where he was kept in confinement for a year or more. Here he dictated to another prisoner an account of his journey to the east; but his stories were very incredulously received by the people of his time. After his liberation he returned to Venice, where he died in 1324, and was buried in the Church of St. Lorenzo. See his work, edited by Col. Sir Henry Yule.

Polybius (*po-lib'i-us*), the Greek historian, was born about the year 204 B. C. at Megalopolis in Arcadia. He was one of the 1,000 Achæans who, after the conquest of Macedonia, in 168 B. C., were sent to Rome on the ground that the Achæans had failed to assist the Romans against Perseus. At Rome, he was the guest of Æmilius Paulus, and became the close friend of his son Scipio Æmilianus, accompanying him in his military expeditions. In 151 B. C., the surviving Achæan exiles were permitted to return to Greece; but Polybius followed Scipio in his African campaign, and was present at the destruction of Carthage in 146 B. C. But the war between the Romans and Achæans afterward summoned him to Greece, where he arrived soon after the taking of Corinth; and so grateful were his people for his services in securing favorable terms from their conquerors that they erected statues in his honor in his native city and elsewhere. It was about this time that he undertook the writing of his great historical work, the design of which is to show how and why all the civilized countries of the world fell under the dominion of Rome. He died about 125 B. C.

Polycarp (*pol'i-karp*), one of the early Christian fathers, was born about the year 69 A. D., and probably of Christian parents. Polycarp's life is a very important one, from the fact that he bridges the period between the age of the original apostles and that of his own disciple Irenæus. Whether he was actually appointed bishop at Smyrna by the Apostle John may well be doubted, but he certainly occupied a prominent position in the church from his earliest manhood. This is the tribute that Irenæus pays to his memory: "I can tell the very place where the blessed Polycarp used to sit and discourse. . . . Whatsoever things he had heard from John and others about the Lord he would relate as having received them from eyewitnesses."

Toward the close of his life, Polycarp visited Rome, and on his return to Smyrna became the victim of a persecution of the Christians in that place. Being offered his life by the proconsul if he would renounce Christ, he answered: "Eighty and six years have I served Him, and He has done me only good—why should I deny Him now?" The games being over, death by fire was substituted for death by wild beasts, the mob eagerly gathering fuel for the flames (A. D. 155.) The only writing left by Polycarp is an epistle to the Philippians, the authenticity of which has been seriously questioned, but may now be considered as clearly established.

Polycrates (*po-lik'ra-tēz*), tyrant of Samos from 536 to 522 B. C. After conquering several islands of the archipelago and even some towns on the Asiatic mainland, he waged a successful war against the inhabitants of Miletus, and defeated their allies, the Thesbians, in a great sea fight. His alliance with Amasis, king of Egypt, proves the importance of this island prince in the eyes even of great monarchs. According to Herodotus, Amasis so dreaded the misfortunes that the envious gods must be preparing for so fortunate a mortal, that he wrote a letter to Polycrates, advising him to give up his most valuable possessions. In compliance with this advice, Polycrates cast a signet ring of beautiful workmanship into the sea, but the next day a fisherman presented his prince with a large fish he had just

caught, and in its belly was found the ring that had been thrown away. From this Amasis concluded that Polycrates was a doomed man, and he immediately broke off the alliance. It is thought by some, however, that Polycrates himself broke off the alliance in order to secure the friendship of the Persian monarch Cambyses. At any rate, when Cambyses invaded Egypt, in the year 525 B. C., Polycrates sent him forty ships in which he placed all the Samians who were hostile to his government, hoping that they would never return. But they soon mutinied against the Persian authority, and sailed back to Samos for the purpose of overthrowing Polycrates. Failing in this effort, they proceeded to Sparta, and formed an alliance with both the Spartans and the Corinthians. A triple force of Samians, Spartans, and Corinthians now besieged Samos in vain, and Polycrates became more firmly established in his authority than ever. But evil fortune overtook him at last. His deadly enemy, Orœtes, satrap of Sardis, enticed him to visit Magnesia, where he was seized and crucified.

Polyembryony (*pŏlĭ-ĕm'brĭ-o-nĭ*) (in plants), a name applied to any case in which more than one embryo occurs in a seed. This is a thing of rare occurrence, although quite a number of embryos start in the seeds of Gymnosperms. As a rule, when several embryos begin, one of them sooner or later develops at the expense of the others, which gradually disappear. Now and then, however, more than one embryo is found in both Gymnosperms and Angiosperms, the extra embryo having arisen either from an extra fertilized egg, as is probably true in the Gymnosperms, or as the budding outgrowth from some part outside of the egg, as is often the case in orange seeds.

Polynesia (*pol-i-nē'shē-ă*), (Greek *polys*, "many"; and *nesos*, "an island"), a term applied to the islands of the Pacific ocean east of the Philippines, New Guinea, and Australia, except Japan, the Kuriles, Aleutians, Queen Charlotte, Vancouver, Revillagigedo, and Galapagos, which are geographical dependencies of the adjoining Asiatic and American continents. These Polynesian islands—also called "South Sea" islands—are distributed over a vast area of the sea, nearly 11,000,000 square miles, but the extent of dry land in this extensive area is less than 200,000 square miles; while the total population is probably less than 1,500,000. Polynesia comprises the three broad divisions of Micronesia, Melanesia, and East Polynesia, and each of these is again subdivided into several secondary groups. Micronesia lies on the extreme northwest, almost entirely north of the equator, and consists almost exclusively of small volcanoes and atolls, forming the five archipelagoes of Pelew, the Marianas, the Carolines, Marshall, and Gilbert. The area of all the islands in this division is only a little over 1,000 square miles; the population is estimated at about 100,000. Melanesia lies in the extreme west, south of the equator, and consists mainly of coral and volcanic islands, disposed in parallel lines from northwest to southeast, forming the eleven archipelagoes of the Admiralty, Bismarck, D'Entrecasteaux, Louisiade, Solomon, Santa Cruz, Banks, New Hebrides, New Caledonia, Loyalty, and Fiji, all inhabited by the Melanesian or dark-brown, oceanic race. The land area of this division is estimated at about 65,000 square miles, and the population at about 410,000. East Polynesia, the third and largest division, lies on both sides of the equator, and consists of the twelve archipelagoes of Hawaii (Sandwich islands), now belonging to the United States, Phœnix, Ellice, Tokelau, Samoa, Tonga, Kermadec, Austral, Cook (Herney), Tahiti (Society), Tua-motu (Low), Marquesas, New Zealand, besides numerous islets, such as Norfolk, Chatham, Easter, and many others. This division is the special domain of the large brown race, commonly called Polynesians, in a special sense. Although the Polynesian islands are spread over so large an area, there is great uniformity of climate among them, except in New Zealand. The mean temperature is about 70°, both in Hawaii and New Caledonia (about the two tropics), with an extreme range from 50° to 90°. For more than a century the oceanic peoples have been in contact with Europeans and Americans, and many of the Polynesians, as well as many of the Melanesians, profess some form of Christianity, the first mission being that to Tahiti in 1797 by the London missionary society. But this contact appears to have caused a remarkable decrease of the native population. For instance, the population of the Hawaiian islands has fallen from 300,000 at the time of Cook's first voyage, in 1797, to 154,000 at the present time, and a similar falling off has occurred in other islands. Everywhere the pure Polynesian race seems to be disappearing, which is a result due in part to the introduction of alcoholic drinks, in part to the changes of habits, dress, etc., introduced by the missionaries, but mainly to the ravages of the various diseases to which the people are subject. See *An Account of the Polynesian Race*, etc., by Fornander.

Polyp (*pŏl'ĭp*), the individual feeding animal in a colony of hydroids. The body is tubular, surmounted by a disc which is surrounded by tentacles. The disc is also perforated in the center by a mouth. The fresh-water hydra is an example of a single polyp. The name also applies to individual coral animals. See HYDRA, and HYDROZOA.

Polypetalous (*pŏlĭ-pĕt'al-ŭs*) **Flowers**, those in which the individual petals are separate and distinct. The contrasting term is "sympetalous" (which see). Polypetalous flowers are thought to be more primitive than

those which are sympetalous. Common illustrations are the buttercups, roses, etc.

Polyphemus (*pol-i-fē'mus*), in classical mythology, the son of Poseidon and the nymph Thoosa. He was a shepherd of immense size, and had only one eye in the center of his forehead. When Ulysses landed on the island of Sicily, he and his companions were seized by Polyphemus and confined in a cave. After the huge cannibal had eaten six of his twelve companions, Ulysses got him intoxicated and put out his eye with a burning pole, thereby escaping from the cave.

Polytechnic (*pŏl-i-tĕk'nik*) **School,** (Greek *polys*, "many"; *techne*, "art"), an institution in which the practical sciences, such as engineering, architecture, etc., are taught. The first school of the kind was established at Paris in the year 1794, under the name of School of Public Works. The Polytechnic School, as it is now called, is the school in which France trains her artillery officers and engineers, her directors of roads and bridges, her telegraph officers, and, in fact, all her officials who need to know something of the higher branches of technical science. In America, the oldest institutions of the kind are the Rensselaer Polytechnic Institute at Troy, N. Y., and the Franklin Institute at Philadelphia, both founded in 1824.

Pombal (*pom-bäl'*), **Sebastian Joseph, de Carvalho e Mello,** Marquis of, the greatest of Portuguese statesmen, was born May 13, 1699, at the castle of Soure, near Coimbra. In 1739, he was appointed ambassador to London, and six years later was sent to Vienna in a similar capacity. Just before Joseph I. ascended the throne, Pombal was made secretary for foreign affairs, and after the great earthquake at Lisbon, in 1755, he displayed such wisdom and ability that in the next year the king appointed him prime minister. After subduing a revolt instigated by the great nobles and the Jesuits, he abolished slavery in Portugal, sought to establish good elementary schools, and published a new code of laws. In addition to this, he reorganized the army and established a Portuguese East India company. The tyranny of the Inquisition was also broken, besides numerous other reforms. On the accession of Maria I. (in 1777) who was under clerical influence, Pombal was deprived of office and banished from court, while many of his institutions were abolished. He died at his castle of Pombal, May 8, 1782. The peasantry of Portugal always speak of him as "The great Marquis."

Pome (*pōm*), a fruit, such as the apple, pear, quince, in which the fleshy part is developed by a flower structure outside of the pistils. This structure is commonly referred to as the calyx, but it is really the cup-like outgrowth from which the sepals, petals, and stamens all arise. See FRUIT.

Pomegran'ate, the fruit of *Punica granatum*, a tree belonging to the loosestrife family. It is a native of Asia, and is very commonly cultivated throughout the tropics and semi-tropics. It is a tree which rises to a height of 15 or 20 feet, and has numerous slender branches, some of which are armed with thorns. The fruit is globular, about as large as a small apple, but with a leathery rind, of a deep golden color tinged with red, and contains very numerous seeds coated with a juicy edible pulp.

POMEGRANATE.

Pomerania (*pŏm'e-rā'ni-a*), a province of Prussia, bounded on the north by the Baltic sea, on the east by west Prussia, on the south by Brandenburg, and on the west by Mecklenburg. It is one of the lowest regions in Germany, and contains but few hills of even moderate height, but numerous lakes and ponds. The river Oder divides Hither Pomerania (next Mecklenburg) from Farther Pomerania, the shore of the latter being lined with sand dunes. The larger portion of Pomerania is under tillage, the agricultural products being varied and numerous. Today, its area is 11,628 square miles, with a population of 1,634,659. Pomerania formed part of the territory of the ancient Vandals, and when they moved south in the 5th century, it was occupied by Slavic tribes, one of whom was called Pomerani — hence the name of the region. The native princes assumed the title of duke in 1170, and joined the German empire. The duchy was overrun by the imperialists in the "Thirty Years' war," and they were followed by the Swedes, who established themselves in Hither Pomerania and in some towns of Farther Pomerania, and it was not until 1815 that the last Swedish possession was surrendered to Prussia. The capital is Stettin, population 210,680.

Pomona (*pō-mō'nä*), the Roman goddess of fruits and flowers. She was greatly beloved by a number of the rustic divinities, among whom were Sylvanus, Picus, and Vertumnus. Propertius tells us that the last named, after vainly trying to approach her under various forms, at last succeeded by assuming the guise of an old woman; and having awakened her feelings of pity, suddenly transformed himself into a blooming youth. In works of art, Pomona is generally represented with fruits in her lap or in a basket, and with a

garland of fruits in her hair and a pruning knife in her right hand.

Pompadour (*pŏn-pä-dōr'*), **Jeanne Antoinette Poisson,** Marquise de, the most famous among the mistresses of Louis XV., was born at Paris, Dec. 29, 1721. She possessed remarkable grace and beauty, and charmed every one with her wit and vivacity. In 1741, she married Le Normant d'Etioles, and soon became a queen of fashion in Paris. But this did not satisfy her, as her heart was set on becoming the king's favorite. At length she attracted the attention of the king at a ball, and ere long she was established at Versailles with the title of Marquise de Pompadour. For twenty years she was almost the absolute ruler of France, the king being merely a spectator of his reign without even taking interest in it. She filled all public offices with her favorites, and made her own creatures ministers of France. Although her policy was disastrous and her wars unfortunate, she retained her position to the end by relieving the king of all business, by diverting him with private theatricals, and even by consenting to his vices and immoralities. At last her nerves gave way under the strain and excitement to which she was subject, and after an illness of twenty days she died April 15, 1764. Her breath fled on the wings of a playful sally, "Stay, Monsieur Curé," she said to the priest, who was leaving her room, "we shall go out together."

Pompeii (*pom-pā'yē*), an ancient Roman city, near the mouth of the Sarnus river and at the foot of Mt. Vesuvius, 13 miles southeast of Naples. It was founded by the Oscans about 600 B. C., and was afterward occupied by the Etruscans and Samnites, the latter being dispossessed by the Romans about 100 B. C. From that time until its destruction in 79 A. D., it was a sort of summer resort, frequented by the Roman aristocracy. In the year 63 A. D., its magnificent buildings were nearly all leveled to the ground by an earthquake, and some years elapsed before the citizens could be induced to return and rebuild them. Before this work was fully completed, in the year 79 A. D., the neighboring mountain of Vesuvius, whose volcanic fires had been slumbering for unknown ages, burst forth in a violent eruption, which buried the cities of Pompeii and Herculaneum under dense beds of cinders and ashes. Amid the deep gloom that covered land and sea the panic of the citizens was aggravated by repeated shocks of earthquake, and for three days the flight continued till Pompeii was abandoned by all who could effect their escape. By the fourth day the sun again became dimly visible, and the more courageous of the citizens began to return for such portions of their property as they could rescue from the ruins. The desolation and distress were so great that the Emperor Titus organized relief on a grand scale, and even undertook to clear and rebuild the city. This attempt, however, was soon abandoned; and the unfortunate city remained a heap of hardened earth and ashes until its very site was forgotten, and even the celebrated topographer Cluverius was unable to fix it with certainty. This difficulty arose in large measure from the fact that the convulsions attending the eruption had turned the Sarnus from its regular course, and so raised the sea beach that the ruins of the city were nearly a mile from the coast. It was not until the year 1748 that an accidental discovery revealed the fact that beneath the vineyards and mulberry grounds which covered the site, there lay the ruins of a city far more accessible, if not more interesting, than those of the previously discovered Herculaneum. The labor of excavation proceeded fitfully until the year 1860, when the Italian government commenced the work of unearthing the city in a systematic and scientific manner.

The general plan of the town is very regular, the streets being straight and crossing each other at right angles, or nearly so. The streets rarely exceed 20 feet in width, the broadest yet found being less than 30 feet, while the back street running parallel to the main lines are only about 15 feet. They are usually paved with blocks of lava fitted very closely together, and the marks of horses' hoofs and the ruts of chariot wheels are still plainly visible. The houses at Pompeii are generally low, rarely exceeding two stories in height. Not more than 300 skeletons have thus far been discovered in the ruins of Pompeii, chiefly in cellars and underground apartments, which fact makes it probable that most of the inhabitants escaped. According to Dion Cassius, a large number of people were assembled at the theatre when the catastrophe occurred; but as no bodies have been found there, they either fled from the city in time to avoid destruction, or their bodies were taken out and buried elsewhere. The population of the city has been estimated as low as 12,000, and as high as 50,000; but the more recent opinions of investigators incline to the lower number. See E. Neville Rolfe's *Pompeii, Past and Present.*

Pom'pey the Great was born in the year 106 B. C., and at the age of seventeen fought with his father in the Civil war between Marius and Sulla on the side of the latter. When Sulla returned from Greece to Italy to oppose Marius, Pompey hastened into Picenum, and there raised an army of three legions, with which he drove the soldiers of Marius out of the district, and then joined Sulla. Soon after this he was sent to destroy the remains of the Marian or democratic faction in Africa and Sicily; and on his return to Rome was granted a triumph and honored with the title of Magnus, "the great." His next exploits were driving the forces of Lepidus out of Italy and fighting the forces of the

brave Sertorius in Spain. Pompey suffered a number of defeats in this campaign, but was able to bring the conflict to a successful issue after the assassination of Sertorius. On his way back to Rome, he routed the remnant of the forces of Spartacus, and thereby closed the Servile war. For this service he was awarded a triumph, while Crassus, who had defeated the main body of the forces of Spartacus, received only an ovation. Pompey was now the idol of the people, and though legally ineligible to the consulship, he was chosen to that position, the senate removing his disabilities by a special act.

In the year 67–66B. C., Pompey again distinguished himself by clearing the Mediterranean sea of the pirates who had so long infested it; and during the next four years he conquered Mithridates, king of Pontus; Tigranes, king of Armenia, and Antiochus, king of Syria. On his return to Italy, he disbanded his army, and in the year 61 B. C. entered Rome in triumph for the third time. Pompey now sought to have his acts in Asia ratified by the senate and certain lands divided among his veterans; and on that body refusing to accede to his wishes, he, in connection with Crassus, formed the alliance with Julius Cæsar, known in history as the "First Triumvirate." For a time they carried everything before them, and the political alliance was made closer and stronger by the marriage of Pompey and Cæsar's daughter Julia. In the year after this, Cæsar led his army into Gaul, and there for nine years enjoyed a career of conquest and glory, while Pompey was idly wasting his time and energies at Rome. Jealousies arose between the two; and after the death of Julia, in the year 54 B. C., Pompey returned to the aristocratic party which desired to check Cæsar's progress, and, if possible, to strip him of his command. The senate ordered Cæsar to disband his army by a certain day, or be declared a public enemy; and he answered this demand by crossing the Rubicon with his soldiers and defying the senate and its army under Pompey. The civil war that ensued was ended with the battle of Pharsalia, in the year 48 B. C., in which Cæsar was completely victorious. Pompey fled to Egypt, and was treacherously murdered while landing from a boat. His head was cut off and presented to Cæsar on his arrival in Egypt. But Cæsar was too magnanimous to be pleased with such a sight, and caused the murderer of Pompey to be put to death.

Pom'pey's Pillar, a celebrated Corinthian column standing near Alexandria, in Egypt, on an eminence south of the walls. Its total height is 98 feet 9 inches, the height of the shaft being a little over 70 feet. The Greek inscription on the base shows that it was erected in 302 A. D., by Publius, prefect of Egypt, in honor of the Emperor Diocletian; and it is supposed to record the conquest of Alexandria by Diocletian in the year 296 A. D.

Ponce de Leon (*pŏn'thā dā lā-ōn'*), **Juan,** the discoverer of Florida, was born at San Servas, in Spain, in 1460; was a court page, served against the Moors, and in 1502 sailed with Ovando to Hispaniola, and became governor of the eastern part of the island. In 1510, he obtained the government of Porto Rico, and had conquered the whole island by 1512, when he was deprived of his post. He then, broken in health, set out in quest of the fountain of perpetual youth, and on the 27th of March, 1512, found Florida, landing a little to the north of where St. Augustine now stands. He secured the appointment of governor of the country, and attempted to conquer his new subjects, but failed and lost nearly all his followers. He died in Cuba, July, 1521.

Pon'cho, an important article of male attire in Chile, the Argentine Republic, and other parts of South America. It consists of a piece of woolen or alpaca cloth, six or seven feet long and three or four feet broad, with a slit of a foot or more in the middle through which the wearer passes his head, so that the poncho covers the shoulders and hangs down before and behind. Waterproof ponchos are worn by soldiers in the army to a great extent, especially by cavalrymen.

Pontiac (*pon'ti-ak*), chief of the Ottawa Indians, was born about the year 1712. In 1746, he defended Detroit, which was then a French settlement, against the attacks of certain hostile tribes, and he is also said to have led his warriors at Braddock's defeat in 1755. After the French had surrendered Canada, his hatred of the English prompted him to organize a combined attack upon all the English garrisons and settlements with a view to the extermination of what he called "those dogs dressed in red." The 7th of May, 1763, was selected as the day for the attack, which in most places was successful; but at Detroit, where Pontiac commanded in person, the commander was forewarned, and a five months' siege ensued. Pontiac resorted to every means familiar to savages to reduce the place, but was unsuccessful. Peace was finally made in 1766, Pontiac being forced to submit to British rule. He was killed at Cahokia, Ill., by a drunken Indian in the year 1769.

Pon'tifex, the title borne by the members of one of the great religious colleges among the ancient Romans, the other being the college of Augurs. Although it is customary to speak of the college of pontiffs as a "priesthood," it was not such, strictly speaking; that is, the members were not charged with the worship of any particular divinity, nor did they conduct sacrifices. The duties of the pontiffs embraced the regulation of all the religious rites and ceremonies of the state —how the gods should be worshiped, how

burials should be conducted, how the manes (departed spirits) of the dead should be appeased. In matters of religion, their authority was supreme; there was no appeal from their decisions; and they themselves were responsible neither to the senate nor to the people. Their president was termed pontifex maximus. Their number, including the pontifex maximus, was originally five, all of whom were taken from the patricians. In the year 300 B. C., the Ogulnian law raised the number to nine, four of whom were to be plebeians. The first plebeian, however, who attained the dignity of pontifex maximus was Tib. Coruncanius, in 254 B. C. Sulla, in 81 B. C., increased the number of pontiffs to 15, and Julius Cæsar to 16, he himself filling the position of pontifex maximus. During the empire, the emperors generally discharged the functions of the position, but after the establishment of Christianity the title was assumed by the bishops of Rome, and the term pontiff is now one of the designations of the pope.

Pontif'ical, one of the service books of the church of Rome, in which are contained the several services in which the bishop, or a priest delegated by the bishop, officiates. The pontifical now in use throughout the western world is the Roman pontifical, first printed in 1485, revised under Clement VIII., in 1596, and repeatedly republished since that time. It contains the services for ordinations, for religious processions, and receptions of monks and nuns, consecrations, benedictions, as well as of the solemn administration of those sacraments by a bishop which are ordinarily administered by priests. Besides the prayers to be recited, the pontifical also lays down the ceremonial to be observed.

Pontine (*pon'tēn*) **Marshes,** a low marshy district forming the southern part of the Campagna of Rome, and extending from Velletri southeast to the sea at Terracina. The length of the plain is about 28 miles, the breadth varying from 4 to 12 miles. The formation of these marshes is due to the fact that the streams flowing down the Volscian mountains cannot find their way to the Mediterranean on account of the accumulations of sand along the coast. The Appian way was projected through this district in the year 312 B. C., and various plans were tried by the ancient Romans for draining the marshes, but with poor success. Popes Boniface VIII., Martin V., and Sixtus V. made earnest efforts to redeem the tract from waste, but the results were far from satisfactory. By the expenditure of some $2,000,000, Pope Pius VI., during the years 1777–96, brought the Pontine marshes to their present state, in which a portion of the land is brought under cultivation, and other portions furnish pasture for horses, cattle, and other animals.

Pontoon' (Latin *pons*, "a bridge"), a number of boats connected together and stretched across a lake or stream of water so as to furnish a temporary bridge for the passage of an army. From the earliest times pontoon bridges have been used in crossing streams; and a pontoon train has become a necessity for every army manœuvering in a country where there are rivers too deep to be forded, many important campaigns having proved failures from lack of pontoons.

Pon'tus, the name given by the ancient Greeks to a country in the northeast of Asia Minor, bordering on the Pontus Euximus (whence its name), and extending from the river Halys in the west to the frontiers of Colchis and Armenia in the east. The name seems to have come into use after the era of Alexander the Great. Previous to that, Pontus was governed by a satrap of Persia. One of these satraps, Ariobarzanes by name, early in the 4th century B. C., laid the foundations of an independent sovereignty. He was succeeded by a line of princes mostly called Mithridates, the greatest of whom, Mithridates VI., proved one of the most formidable enemies that Rome ever encountered. After he was overthrown by Pompey, in the year 66 B. C., Pontus was annexed to Bithynia.

Poole, William Frederick, an American bibliographer and librarian, compiler of the *Index to Periodical Literature*, was born at Salem, Mass., Dec. 24, 1821, and graduated at Yale college in 1849. While at college he was librarian of a literary society, and prepared the first edition of his *Index*, subsequent editions appearing in 1853 and 1882. A supplement by Poole and W. J. Fletcher was issued in 1888. He was for many years librarian of the Chicago City library, and later was librarian of the great Newberry library in that city. He died at Chicago, March 1, 1894.

Poo'na or **Poo'nah,** a town in British India, situated on the Muta, 120 miles southeast of Bombay. Although the place abounds in beautiful gardens, the streets are mostly crooked and narrow, and the houses poor. The city was the capital of the Mahratta princes, but was occupied and annexed by the British in the year 1817. Here have been built the Decca college and the college of science, a normal school, a high school, and other educational establishments. Population with suburbs 171,000.

Poor Laws. The obligation of providing for the poor has been recognized by all civilized nations. Among the primitive peoples of the earth, the giving of alms to those who were in need was inculcated as a religious observance, and the ancient European nations regarded a provision for the poor as a matter of state policy. In early times, Athens could boast of having no citizen in want, "nor did any disgrace the nation by begging." But war at length brought poverty in its train, and the state decreed the maintenance of those

who were wounded in battle, and afterward of the widows and children of those who fell. There were also societies for the relief of distress among some of the Grecian states. Among the Romans the distribution of grain was introduced by Caius Gracchus, and continued till the fall of the empire. In the time of Augustus, 200,000 people were thus fed. Cicero mentions this provision of the Roman law as one in high favor with the people, since it furnished them abundant subsistence without labor; other Roman writers describe its results as injurious, creating a nation of idlers and mendicants, and leaving the soil uncultivated.

In the middle ages, the great body of the laboring classes were in a condition of serfdom, and looked to their feudal lords for support. But the Church of Rome constituted herself the great receiver and dispenser of alms. The rich monasteries and abbeys distributed doles to the poor, as is still done at the mosque under the Mohammedan system. In most states of continental Europe, the church remains to a greater or lesser extent the source of relief to the poor, the state only stepping in when the contributions of the church and of private charity are insufficient. In England, the statute of 1388 is the first that makes provision for the impotent poor. Various statutes were passed after that time, culminating in the statute of 1601, which has formed the basis of the poor-law system of England up to the present time. It taxed every inhabitant of every parish for the relief of the poor, and directed the justices in every county to appoint three or four substantial householders in each parish to be overseers of the poor in connection with the churchwardens.

Various efforts were made to remedy abuses which arose under this system, of which the workhouse system was one of the earliest. All who refused to be lodged in the workhouse were refused relief. But the act of 1796 repealed the workhouse test and allowed relief to be given in aid of wages, so that the poor-laws were practically turned into a mode of paying wages. Various changes were made from time to time, and finally in 1871 the poor-law board was abolished and its powers were transferred to the local government board. The fundamental rule in England and Wales is that each parish is bound to maintain its own poor, and this is done by a poor-rate which churchwardens and overseers may levy on all persons occupying land in the parish. In 1899, the poor-rates raised for the year, under the Local Government act of 1894, amounted to over a hundred million dollars.

In the United States, a system of relief somewhat similar to that of England prevails in most of the states. "Poor-houses" are established by the county authorities, to which persons unable to support themselves are transferred and cared for, such work as they are able to do being provided for them. In some states, provision has been made for "children's homes," where all children under a certain age, whose parents are dead or unable to provide for them, are fed, clothed, and educated. Happily thus far the number of dependent persons in America is so small that the tax for their support is not seriously felt.

Poore, Benjamin Perley, an American journalist, was born at Newburyport, Mass., Nov. 2, 1820. He was apprenticed to a printer when a boy and grew up in a newspaper office. From 1838 to 1840 he edited the *Southern Whig* at Atlanta, Ga. He was sent with the embassy to Belgium in 1841, as an attaché, and remained in Europe seven years. While abroad he collected valuable data for the archives of the state of Massachusetts. In 1854, he was Washington correspondent of the Boston *Journal*, and served at the same time as clerk of the Senate committee for printing records. He became editor of the *Congressional Directory* in 1867. He published a number of works, among which those most largely sold were the *Life of Zachary Taylor* (1848), the *Conspiracy Trial for the Murder of Abraham Lincoln*, and *Sixty Years at the Federal Metropolis*. He died at Washington, D. C., May 30, 1887.

Pope, a title first given to all bishops of the Christian church, but now exclusively applied to the bishop of Rome, or head of the Catholic church. Tradition, confirmed by the faith of the church, represents St. Peter as the first bishop of Rome. Whether he were such or not, it was certainly natural that the early bishops residing in the imperial city should acquire a large measure of influence and importance, and that after the empire became Christian, they should attain some considerable degree of temporal power. The temporal power of the pope was not fully established, however, until the year 754, under Pepin, king of the Franks. From that time forward, the history of the papacy has been a contest, of greater or lesser intensity, with the princes and rulers of Europe, in which now one and now the other of the contending parties prevailed. At the present time, the pope is stripped of all temporal power, but his authority over the church in all matters spiritual and ecclesiastical is supreme and unquestioned, the Vatican council which assembled at Rome in the year 1870 having proclaimed his infallibility on all questions of faith and morals. Whenever a vacancy occurs in the papal chair, it is filled by the cardinals choosing one of their number to occupy the place. A history of the more important popes will be found under their several titles.

Pope, Alexander, English poet, was born at London, May 21, 1688, his father being a Roman Catholic and a man of considerable means. Although Pope's early education

was rather irregular and unsystematic, his father retiring from business and removing to Binfield, near Wokingham, soon after his birth, his application to study must have been very close, for even in his juvenile poems there are many traces of profound thought. In 1711, Pope published his *Essay on Criticism*, which placed him at once in the front rank of the literary men of his day; and in 1712 appeared the *Rape of the Lock*, which may be considered the most imaginative of all his poems. Soon after this appeared his translation of Homer's *Iliad*, which brought him a fortune of some $30,000. A translation of the *Odyssey* followed a few years later, and in 1728 he issued the third volume of *The Dunciad*. The *Essay on Man*, published in 1734, is a didactic poem, and although almost wholly deficient in the imaginative quality, is a masterpiece of wit and versification. Pope's command of terse and smooth expression is here seen at its highest; and it has been well said that this poem contains more familiar quotations than any other poem of equal length in the English language. Pope died at Twickenham, near London, May 30, 1744, leaving behind him a literary fame that has suffered no eclipse in a century and a half.

Pope, John, an American general, was born at Louisville, Ky., March 16, 1822, and graduated at West Point in 1842, after which he entered the engineer corps of the United States army. He served in the Florida war of 1842–44, and afterward in the Mexican war, winning the rank of captain for his conduct at the battles of Monterey and Buena Vista. At the outbreak of the Civil war, he was appointed brigadier-general of volunteers, and in the spring of 1862 highly distinguished himself by the capture of New Madrid, Mo., and "Island No. 10," in the Mississippi river. On account of these signal successes he was transferred to the east and placed in command of the forces formerly under Generals Fremont, McDowell, and Banks, each of whom had been outgeneraled and beaten by "Stonewall" Jackson. He conducted a very active and vigorous campaign against Lee and Jackson, but was defeated at the second battle of Bull Run, Aug. 29–30, 1862. He then requested to be relieved, and was transferred to the department of the northwest. Pope attributed his defeat to the failure of Gen. Fitz John Porter to attack Jackson's forces, as ordered on the 29th of August. Porter was court-martialed for this offense and dismissed from the army, but in 1886 he was restored. In the year 1882, Pope was made a major-general in the regular army, and retired on half-pay in 1886. He died while on a visit to the Soldiers' and Sailors' Home at Sandusky, O., Sept. 23, 1892, and was buried at St. Louis, Mo., three days later.

Pop'lar, a species of the genus *Populus*, which belongs to the willow family. The genus contains about twenty-five species, which are natives to the northern hemisphere, about half of them belonging to North America. The poplars may be divided in general into two groups, the balsam poplars with sticky buds, and white poplars or aspens with buds not sticky. The common balsam poplar is *P. balsamifera*, sometimes also called "tacaamhac." One of its varieties (*candicans*) is known as the "balm of Gilead." The common "cottonwood" or "Carolina poplar" is *P. moniliferа*. The black poplar of Europe (*P. nigra*) is familiar in this country through its variety *italica*, which is the Lombardy poplar, probably of Asiatic origin.

POPLAR LEAF AND CATKIN.

The common American aspen is *P. tremuloides;* the larger species being *P. grandidentata*, which is in cultivation in its "weeping" forms. A very commonly planted wild poplar is the "abele" of Europe, *P. alba*, which has leaves white cottony beneath. The name "poplar" or "white poplar" has also been wrongly applied to a tree in a very different group, namely, the great "tulip tree" (*Liriodendron*), which is closely related to the magnolias. It is this tulip tree which yields the so-called "poplar" lumber of commerce.

Pop'lin, a fabric of dry goods produced by weaving a weft of worsted yarn into a warp of silk. On account of worsted yarns being thicker than the silk, poplins always have a corded appearance. They may be either plain or figured, and are used for dress goods, and for fine upholstery. The manufacture of poplin goods is of French origin, and was introduced into England and Ireland by Protestant refugees during the 17th century.

Popocatapetl (*pō-pō-kä-tä-pet'l*), a volcano about 40 miles southeast of the City of Mexico. It rises in the form of a cone about 1,700 feet above the level of the sea. Although smoke still issues from the mountain, no eruption has taken place since 1540. It is frequently scaled, and in its crater, which is nearly a mile in diameter and about 1,000 feet deep, much sulphur is found.

Pop'py, species of the poppy family (*Papaveraceæ*), but in the narrowest sense the name belongs to the genus *Papaver*, to which the opium poppy (*P. somniferum*) of the Old World belongs. This poppy is largely cultivated in Europe and Asia for its capsule, from which the drug opium and the poppy oil are obtained. It is a native of the Mediter-

ranean region. Among the commonest native poppies are the "argemones" or "prickly poppies," which are found in cultivation, and also occur over vast areas in the west. The common "blood root" (*Sanguinaria Canadensis*) of the early spring is also a poppy, while the "yellow" or "celandine poppy" (*Stylophorum diphyllum*) is also a well-known poppy of the early spring. The Californian poppy, with its pale dissected leaves and long-stalked brilliantly colored flowers, is *Eschscholtzia Californica*. It occurs in California in great masses, often giving most brilliant and variegated colors to a landscape. This poppy is extensively cultivated.

OPIUM POPPY.

Por'celain. See POTTERY.

Por'cupine, an animal with sharp spines or quills among the hairs. The Old World porcupines are ground animals and live in burrows; those of the New World are mainly tree animals. They belong to the group of rodents or gnawing animals. The common Canada porcupine has a stout body, about forty inches long, with a short tail. The hair is dark brown, and the spines are from four to six inches long. They are almost hidden in the hair. These animals occur from Maine to Texas. The tree porcupine of tropical South America and Mexico is of slighter build, and has a tail capable of grasping.

PORCUPINE.

Poros'ity, a term by which we express the fact that no body of matter, whether solid or liquid, completely fills the space it occupies, as the particles or molecules of all bodies have spaces between them filled with air, which spaces are called *pores*. Many objects, such as wood and cloth, show their porosity by the readiness with which they absorb water or any other liquid. Under heavy pressure, water has been forced through iron, silver, and other metals; and the porosity of water itself has been proven by mixing it with alcohol and noting the fact that the bulk of the mixture is much less than the sum of the two bulks before the mixture.

Porphyry (*pôr'fi-ry*), the name applied to those igneous rocks which are made up of large and distinct crystals, imbedded in a matrix of small and often indistinct crystals. The term also is sometimes applied to lavas, the matrix of which is but partly crystalline. The name, therefore, refers to the structure of the rock, not to its composition. A granite would be called porphyritic if some of its crystals, for example some of its feldspar crystals, were conspicuously larger than others. A quartz porphyry is one in which the conspicuous crystals (phenocrysts) are all quartz. Light-colored igneous rocks are more commonly porphyritic than dark ones.

Porpoise (*pôr'pŭs*), a sea mammal belonging to the group of toothed whales. They are similar in general appearance to dolphins, but have a shorter snout. They are dark above and whitish below. Porpoises are common in the North Atlantic near shore, and often ascend rivers. They feed on such fish as mackerel and herring, for the capture of which their teeth are well adapted. The bay porpoise of the Pacific coast is the smallest of the whale family, being often not more than four or five feet long. Some other species of porpoises reach a length of about nine feet. Their very thick hide is beaten down and made into soft leather. Their fat yields an oil of fine quality.

PORPOISE.

Port Ar'thur, called by the Chinese "Lu-shun-k'ow," is a naval station on the north coast of China, in the province of Shing-king, about 275 miles east of Peking. Up to 1881 it was merely a harbor of refuge for coast-wise sailing vessels; but in that year China determined to make it a naval port for her northern squadron. It is entirely surrounded by hills; and at great expense it was fitted up with dry docks, foundries for the casting of heavy ordnance, and everything needful to constitute it an important station. It grew from a mere handful of mud huts in 1881, to a place of 6,000 inhabitants in 1893. In 1894, it was destroyed by the Japanese, as a result of the war provoked by China. In 1898, Russia obtained a lease of this harbor for twenty-five years, subject to renewal; and with it was obtained possession of the adjacent seas and all the Chinese territory to the north. This whole area is under the civil and military control of a governor appointed by Russia. Port Arthur, though small, is naturally impregnable; and its many fortifications are being made still more formidable by the Russian authorities. A certain part of the harbor is open to the commerce of all nations, but other parts are strictly reserved for Russian (and Chinese) men-of-war. The acquisition of Port Arthur by Russia led to

the occupation of Wei-Hai-Wei by Great Britain.

Port Dar'win, one of the finest harbors in Australia, is situated on the coast of the northern territory of South Australia, which is nearly 16 times the size of England. Its entrance is two miles wide, and vessels of any tonnage can sail in it with safety. Palmerston, the chief town on its shores, is the land terminus of the overland telegraph, and is the starting-point of a railway to the gold fields of the interior, 150 miles distant. A telegraph line is run overland from the north to the south of Central Australia, that is from Port Darwin to Adelaide, the capital, a distance of over 2,000 miles.

Port Eliz'abeth, a seaport of the British colony of the Cape of Good Hope, is situated on the western shore of Algoa bay, 85 miles by rail from Graham's town, and 350 miles from Kimberley. Its public buildings are the town house, the provincial hospital, churches, a college, a library, a museum, etc. The town was laid out in 1820, and in 1891 the population had grown to 23,266.

Port Hu'ron, a city of Michigan, is on the St. Clair river, where it issues from Lake Huron. The city has a fine custom-house, shipyards, and dry docks, sawmills, grain elevators, and a large commerce in timber brought down by the Black river. A railway tunnel, passing under the St. Clair river, connects the town with Sarnia, in Canada, and steamboats ply the river daily between Port Huron and Detroit. Population in 1900, 19,158.

Port Lou'is, the capital and principal port of the British colony of Mauritius in the Indian ocean, is situated on the northwest coast, and is inclosed by a circle of lofty hills. It is a coaling station of the British navy, and has barracks, harbor defenses, and military storehouses. Population with suburbs in 1899, 52,517.

Port Said (*sä'ēd*), an Egyptian seaport town on the west side of the Suez canal, on a strip of land between Lake Menzaleh and the Mediterranean. The place was named after Said Pasha, the promoter of the Suez canal, and depends wholly on the canal trade, being mainly a coaling station for steamers. Population 42,095.

Port'cullis, a strong timber or iron grating sliding up and down in the jambs of an entrance to a castle for the purpose of defending it from assailants. The lower ends of the vertical bars had spikes to stick in the ground, or to injure those on whom it might fall. A powerful mechanism of windlasses was required to work the portcullis.

Por'ter, David, an American naval officer, was born at Boston, Mass., Feb. 1, 1780. He was appointed a midshipman in the navy in 1798 and lieutenant in the year after. At the beginning of the War of 1812, he was made captain, and captured the first British ship taken in the war. In 1813, with his ship *Essex,* he nearly destroyed the English whale-fishery in the Pacific and took possession of the Marquesas islands; but in March, 1814, his frigate was destroyed by the British in Valparaiso harbor, and he returned home on parole. He afterward commanded an expedition against the pirates in the West Indian waters, and was court-martialed and suspended from duty for six months for compelling the authorities of Porto Rico to apologize for imprisoning some of his officers. In the year 1826, Porter resigned his commission in the United States navy and was placed for a time at the head of the Mexican navy. In 1829, he was appointed consul-general to the Barbary states and afterward minister to Turkey. While acting in the latter capacity he died at Constantinople, March 3, 1843.

Por'ter, David Dixon, an American admiral, son of the above, was born at Chester, Pa., June 8, 1813. He accompanied his father on his cruise against the pirates in 1825, and was for some time a midshipman in the Mexican service. He entered the United States navy in 1829, and after being employed on the coast survey from 1836 to 1841 he became lieutenant, and then served till 1845 on the Mediterranean and Brazil stations, afterward returning to the coast survey. At the commencement of the Civil war, he was appointed commander of the *Powhatan* and ordered to Pensacola; but afterward he was placed in command of the mortar flotilla, with which, under Farragut, he successfully bombarded the forts of New Orleans. In 1863, he was placed in command of the Mississippi gunboats and rendered such signal service in the siege of Vicksburg that he was raised to the rank of rear-admiral. Transferred to the North Atlantic squadron, in December of the next year, he bombarded and silenced Fort Fisher, and in January, 1865, the place was captured by the combined action of the military and naval forces. At the close of the war, Porter was made vice-admiral, and in 1870 succeeded Farragut as admiral of the navy. He died at Washington, D. C., Feb. 13, 1891.

ADMIRAL PORTER.

Por'ter, Fitz-John, an American general, was born at Portsmouth, N. H., Aug. 31, 1822, and graduated at West Point in 1845.

During the Mexican war he participated in the siege of Vera Cruz and in the battles of Cerro Gordo and Chapultepec, and was wounded in the assault upon the City of Mexico. In the summer of 1861, having been appointed brigadier-general of volunteers, he was placed in command of a division of the army of the Potomac by General McClellan; and at the opening of the Virginia peninsular campaign, in the spring of 1862, he superintended the siege of Yorktown. Soon after this, Porter was placed in command of the 5th army corps, and took an active part, distinguishing himself both for courage and military skill in the "Seven Days' battles," especially at Malvern Hill. After McClellan's retreat, his corps was ordered to re-enforce General Pope in his campaign against Lee and Jackson. On the 29th of August, Porter received an order a short time before sunset to attack Jackson, which he did not obey. General Pope was much aggrieved at this failure of Porter's, and in the November following preferred charges against him, under which he was court-martialed and dismissed from the service. Pope claimed that Porter's disobedience was willful and was the cause of his defeat; Porter justified his action on the ground that the order was received at too late an hour to make the attack successful, and that he had only exercised the discretion that is allowed to subordinate commanders in such emergencies, as his corps would certainly have been overwhelmed by the superior forces in front of him if he had made the attack as ordered. The justice of Porter's sentence was the subject of discussion for more than twenty years, and in the year 1886 he was restored to his rank of colonel in the United States army. From 1884 to 1888, he was police commissioner of New York city, and from 1893 to 1897 was cashier of the New York post office.

Por'ter, Horace, an American soldier and diplomat, was born at Huntingdon, Pa., April 15, 1837, and educated at West Point. He served during the Civil war as chief of ordnance in the army of the Potomac and in the army of the Cumberland, and as aid-de-camp to General Grant in the last year of the war. He was also General Grant's military secretary for a number of years, and later his private secretary. He reached the rank of brigadier-general during his career in the army, from which he resigned in 1873. In 1897, he was appointed ambassador to France, which position he has since filled.

Por'ter, Jane, author of *The Scottish Chiefs* and other works, was born at Durham, England, in 1776, daughter of an army surgeon, who died soon after her birth. She was brought up at Edinburgh and at London, and made a decided reputation, in 1803, by her romance, *Thaddeus of Warsaw*, which was followed by her most famous work, *The Scottish Chiefs*, in 1810. This work has a remarkable interest for youthful readers, and had the merit of inspiring Sir Walter Scott to write *Waverley*. Among her other works were, *The Pastor's Fireside*, *Tales Round a Winter's Hearth*, *The Field of Forty Footsteps*, etc. She died at Bristol, May 24, 1850.

Por'ter, Noah, president of Yale college, was born at Farmington, Conn., Dec. 14, 1811, and graduated at Yale college in 1831. After teaching for a number of years and taking a course in theological study, he became pastor of a Congregational church at New Milford, Conn., and afterward at Springfield, Mass. In 1846, he was elected professor of metaphysics and moral philosophy at Yale college, and after filling that position for 25 years, in 1871 he was chosen president of the institution, which position he held until the year 1886, when he retired and was succeeded by Dr. Theodore Dwight. He died at New Haven, Conn., March 4, 1892. Among Dr. Porter's numerous works are, *The Human Intellect*, *Books and Reading*, *Elements of Intellectual Science*, *Elements of Moral Science*, and an edition of *Kant's Ethics*. He was the editor of Webster's *Unabridged*, and of the *International Dictionary*.

Port'land, the largest city and chief port of entry in Maine, is situated on Casco bay, about 60 miles from Augusta, the capital of the state, and about 100 miles from Boston. A number of islands in the bay are included in the corporation, but the city proper is situated on a peninsula three miles in length and less than a mile in width. The Grand Trunk railroad and six other lines terminate at Portland, and there are regular lines of steamers connecting the city with New York, Boston, and other points on the Atlantic coast. The harbor, which is defended by three forts, is deep enough for vessels of all sizes, and is seldom frozen over. A large foreign trade is carried on with the West Indies, and also with European and South American countries, the value of both imports and exports amounting to several million dollars every year. Portland was first settled by an English colony in 1632. In 1866, a destructive fire swept over the city, destroying property to the amount of $10,000,000, but the burned district has long since been rebuilt. Population 50,145.

Port'land, the largest city of Oregon, is on the Willamette river, near where it joins the Columbia, about 100 miles from the ocean, and about 800 miles from San Francisco. It is a prosperous port of entry, large ocean ships coming up to this point. Clearing-house returns for 1900 show a total commerce for that year of over $100,000,000, with an export trade of $20,000,000. Portland was founded in 1844, and became a city in 1851. Population 90,426.

Port'land, Isle of, a rocky island or peninsula in Dorsetshire, England, connected with

the mainland by a long, narrow ridge called Chisel Bank. It is four and a half miles long, one and a half miles wide, and nine to ten miles in circumference. The coast line is rough and precipitous, the only landing place being on the north, opposite Weymouth. From its highest point, the Verne (495 feet in height), presents an almost unbroken slope to Portland Bill, the southern extremity, where stand two lighthouses, showing fixed lights 210 and 136 feet above the sea level. Between this point and the Shambles, is a dangerous reef three miles southeast, while a surf, called the Portland Race, is raised by the impetuous tides. By the construction of a magnificent "breakwater," over two miles in length, the building of which occupied twenty-three years, a harbor of refuge has been formed, affording anchorage for a large fleet of vessels. Population 11,000.

Port'land Vase, a celebrated ancient Roman glass vase or cinerary urn found during the pontificate of Urban VIII. (1623–44) in the Monte del Grano, near Rome. It was purchased by Sir Willian Hamilton in 1770, and a few years later by the Portland family, who deposited it in the British museum. The vase was broken into pieces by a lunatic in 1845, but the fragments were very skillfully united again. It is ten inches in height, and is the finest specimen of an ancient cameo cut glass that is known.

Por'to Rico (*rē'kō*), a West India island formerly belonging to Spain, first settled by Ponce de Leon in 1510. It is about 100 miles in length and 36 in width, and is traversed from east to west by ranges of mountains, from whose bases rich tracts of soil extend to the sea on all sides. Its estimated area is 3,600 square miles. Rain falls in much greater abundance on the northern than on the southern part of the island. The principal products are sugar, coffee, and rice, although tobacco, corn, yams, bananas, and tropical fruits are grown. The chief towns are San Juan, the capital, Mayaguez, and Ponce. The population of Porto Rico has increased from 155,400 in 1800, to about 953,243 in 1899. At the conclusion of the Spanish-American war, in 1898, Porto Rico was ceded to the United States. At present (1901) the island is under military rule, but legislation is in progress at Washington to secure for it representative government, with, if practicable, free trade between the United States and it. In May, 1900, an act of congress, designed to provide revenues and erect civil government, went then into effect.

Ports'mouth, the chief naval arsenal of Great Britain, is situate on the southwest shore of Portsea island, at the entrance to Portsmouth harbor, and opposite the town of Gosport, with which it is connected by a steam ferry. The fortifications of Portsmouth comcomprise, on the landward side, the outer line of the Portsdown forts and the Hillsea lines; to seaward, the Spithead forts. Portsmouth harbor, only about 400 yards wide at its entrance, expands into a spacious basin, extending inland about four miles, and having a breadth of three miles along its northern shore. This harbor is situated in the middle of the channel, close to the anchorage of Spithead, where 1,000 ships of the line may ride without danger or inconvenience, and is under the shelter of the Isle of Wight. Opposite to it is the French arsenal of Cherbourg. Population 115,000.

Ports'mouth, county seat of Scioto county, O., stands on the Ohio river at the mouth of the Scioto, 100 miles above Cincinnati. It has several iron foundries, rolling mills, and various manufactories, besides newspapers, schools, churches, etc. Population 17,870.

Ports'mouth, Va., the capital of Norfolk county, on the Elizabeth river, opposite Norfolk, with which city it is connected by ferry. Near by, at Gosport, is the Norfolk United States navy yard, on an islet of the Atlantic, south of Hampton Roads. It is served by the Atlantic and Danville, the Seaboard Air Line, and the Norfolk and Caroline railroads. It has steamship connection with Baltimore and the chief Atlantic seaports; it has dry docks, a naval hospital, and marine barracks. Here, too, are the shops of the Seaboard Air Line railroad. Population 17,427.

Por'tugal, a kingdom in Europe on the west side of the Iberian peninsula, about 350 miles in length, and from 70 to 140 miles in width. It is bounded on the north and east by Spain, and on the south and west by the Atlantic ocean. Total area, 36,038 square miles. The population increases steadily, but slowly. In 1851, it numbered only a little over 3,000,000; in 1874, it was over 4,000,000; and at the present time it may fairly be estimated at 5,050,000.

The most important mountain range of Portugal is the Sierra da Estrella, a westward continuation of the Spanish Sierra Guadarrama system; and the Sierra Morena is also continued westward in southern Portugal. Ocean breezes temper the climate of Portugal, and exempt it from the dry heat to which Spain is subject. The inequalities of surface, however, produce considerable diversities of climate; thus while snow falls abundantly on the mountains in the northern provinces, it is never seen in the lowlands of the southern districts, where spring begins with the new year and harvest is over by midsummer. The soil is generally fertile; but agriculture is in a backward state, little more than half the area of country being put to profitable use. The most prosperous branches of industry are the cultivation of the vine and the olive; from the former is derived the rich red wine, familiarly known as "Port," from its being shipped at Oporto, "the port." The total quantity of wine annually exported from Portugal amounts to 20,000,000 gallons.

Fish are abundant in all the rivers and off the coasts; and of late years attention has been given to the cultivation of oysters. The manufacturing industries of Portugal are chiefly concentrated in the two cities of Lisbon and Oporto. In all, about 90,000 persons are engaged in manufacturing pursuits, and nearly half of these are employed in weaving wool. In 1898, about 1,464 miles were open, of which 507 miles belonged to the state. The exports of the kingdom average about $32,000,000 annually, and the imports are nearly twice that amount. The chief mineral products include copper precipitate and copper ore, ore for sulphur, lead ore, and anthracite, and lignite. The national debt of Portugal has increased from about $100,000,000 in 1856 to about eight times that amount at the present time. Every male Portuguese over 21 years old is liable to service in the army — the term being three years with the colors and nine in the reserve. On a peace footing, the army embraces about 30,000 men, the war strength being about 150,000 men of all arms. The state religion is Catholic, but toleration is extended to all creeds. Education is superintended by a council and is entirely free from the control of the church. Compulsory education was enacted in 1844, but is not generally enforced; and therefore Portugal is far behind in education and intelligence. The one university, at Coimbra, established in 1290, is one of the oldest in Europe, and has 75 professors and nearly 1,300 students. Lisbon has a learned society, the Academy of Sciences, and a public library of 250,000 volumes.

Portugal is a constitutional monarchy, the crown being hereditary alike in the male and the female line. The parliament, or *cortes*, is composed of the house of peers and the house of deputies. The house of deputies consists of 138 members, elected by the people, elections being held every four years. The Portuguese differ greatly from the Spaniards, whom they regard with no small degree of hatred, mainly on account of attempts of Spain to subvert the independence of Portugal in the past. Lisbon and Oporto have a population, the former of 301,206, and the latter of 138,860; no other town in the kingdom reaches 30,000. The history of Portugal in ancient times, and for several of the first centuries of our era, was coincident with that of the Iberian peninsula as a whole; but in 1143 Alfonso I. made it an independent kingdom. During the latter part of the 15th century and the earlier part of the 16th, Portugal ranked as one of the most powerful monarchies in Europe, and Lisbon, the capital, was the distributing center of the products of the east, as well as one of its most important commercial cities. But from various causes it so declined and degenerated that in 1580 Philip II. annexed it to Spain. It remained subject to the Spanish monarchy until 1640, when after a forced union of sixty years, it succeeded in recovering its independence; and in 1668 its independence was formally recognized by the Spanish government. But, in her conflicts with Spain and the Netherlands, Portugal lost many of her colonies, and the nation which had once been the greatest maritime power on earth became one of the weakest and most insignificant. Under the reign of Joseph I., his minister, Pombal, sought to revive the national credit and restore the government to its former vigor and efficiency, but when Joseph's daughter Maria became queen, all progress was arrested. The insanity of Maria led, in 1799, to the establishment of a regency under her eldest son, John; and when that prince learned that Napoleon had resolved on the extinction of his dynasty, he left Portugal in 1807, and transferred the seat of government to Rio de Janeiro, in Brazil, which country at that time belonged to Portugal. Even after the French were driven out of Portugal, and Napoleon's power was broken, John continued to reside in Brazil, leaving Portugal to be governed by English officers — Marshal Beresford and others. This gave rise to such abuses and discontent that in 1820 a constitutional form of government was proclaimed at Lisbon in place of an absolute monarchy. John hurried home in this emergency, but was immediately forced to sign the new constitution, and to recognize the independence of Brazil, of which his son, Pedro, became emperor. On the death of John, in 1826, Pedro IV. organized the government after the model of the English, and then renounced the crown in favor of his daughter, Maria II., but in 1828, her uncle, Miguel, gathered around him a number of the clergy, army officers, and the old nobility, and was proclaimed king by the Cortes. Then ensued a period of great confusion and misrule; but in 1834 Miguel was overthrown, and renounced all pretensions to the crown. Maria II. remained queen until her death, in 1853, when she was succeeded by her son, Pedro V. Upon the sudden death of Pedro, in 1861, he was succeeded by his brother, Dom Luis, who continued to reign over the kingdom until he was succeeded by his son, Charles I., in 1889. The dependencies still owned by Portugal include Macao, in China; Timor, in the Malay archipelago; the Cape Verde islands; also those of St. Thomé and Principe, Portuguese Guinea, Portuguese East Africa, and Angola. See *Portugal* ("History of Nations" series), by Morse Stephens.

Poseidon, the Greek name for the mythical deity called by the Romans Neptune. He was said to be the son of Cronos (Time), and brother of Zeus. He was the husband of Amphitrite. He chose as his portion of the universe, the sea; and to the Greeks, surrounded by the sea, he naturally figures much in their literature and art. Under him are all other sea divinities. The waves are his horses; the trident, his scepter, and he is lord

of storms and giver of calm. He is usually depicted riding in his chariot; Zeus, as sitting upon his throne.

Po'sen, a province of Prussia, bounded north by West Prussia, east by Poland, south by Silesia, and west by Brandenburg. The province belongs to the great plain of north Germany, and there are several lakes in the east. About 60 per cent. of the area (11,184 square miles) is arable land and under cultivation, the principal products being grain, potatoes, and hops. Posen formed an integral part of Poland till 1772, when at the first partition the districts north of the Netze were given to Prussia; to these was added, in 1793, Great Poland, except Masovia, the whole being incorporated under the name of South Prussia. In 1807, Posen was included in the duchy of Warsaw; but it was reassigned to Prussia by the congress of Vienna in 1814, under the name of the Grand-duchy of Posen. Population 1,888,055, of whom 880,000 are Poles, and 725,000 Germans.

Po'sen, the chief town of the Prussian province of Posen, and a fortress of the first rank, is situated on the Warthe, 150 miles by rail from Berlin. In the 16th century, it was an important trading mart, but before the end of the same century it began to decline. The chief manufactures are artificial manures, agricultural implements, furniture, carriages, etc. Population 117,014.

Post-Mor'tem Exam'ination (Latin *post*, "after," and *mors*, "death"). Examination of the body after death is a duty which has to be performed by physicians in a variety of circumstances, of which the most important are (1) cases of sudden and accidental death, (2) cases of illness in which the nature of the disease could not be determined.

Post Office, the department of government whose business it is to convey letters, papers, books, and small parcels of merchandise from place to place. It is so called from the posts established along the roads of the Roman empire where couriers were placed in readiness for conveying news and dispatches. Some other ancient countries had similar posts; but in all cases they were for government service only, the carrying of private letters or dispatches being no part of their duties. The beginning of a postal service in the United States dates from the year 1639, when a house in Boston was employed for the receipt and delivery of letters for or from beyond the seas. In 1672, the government of New York colony established "a post to go monthly from New York to Boston"; and in 1702 it was changed to a fortnightly one. A general post office was established in Virginia in 1692, and in Philadelphia in 1693. A deputy postmaster-general for America was appointed in 1692; and by an act of parliament, in 1710, he was directed to keep his principal office in New York, "and other chief offices in some convenient place or places in other of her majesty's provinces or colonies in America." The system, however, was a comparative failure until Dr. Benjamin Franklin became postmaster-general in 1753. Franklin filled this office until the year 1774 with such ability and efficiency that when he was removed from the position in 1774 the net revenue of the department exceeded $15,000.

In 1789, when the new Federal government was organized, the number of post offices in the thirteen states was only about seventy-five. The following table will show the progress that was made during the first century of our history:—

Years.	No. of Offices.	Revenue.	Expenditures.
1790.....	75	$ 37,935	$ 32,140
1800.....	903	280,804	213,994
1810.....	2,300	552,366	495,969
1820.....	4,500	1,111,927	1,160,926
1830.....	8,450	1,850,583	1,932,708
1840.....	13,468	4,543,522	4,718,236
1850.....	18,417	5,552,971	5,212,953
1860.....	28,498	8,518,067	19,170,610
1870.....	38,492	19,772,221	23,998,837
1880.....	42,989	33,315,479	36,542,804
1890.....	62,401	60,858,783	66,645,083
1899.....	75,000	95,021,384	101,632,160

As will be seen, the expenditures of the post office department exceed the receipts, which is due to the fact that the postage on papers, books, etc., is so low that they must necessarily be carried at a loss, and also to the improvements that are made in the service from year to year. Some idea of the vast business of the department may be obtained from the number of letters, papers, etc., carried in the year 1890:—

Letters, postal cards, etc	2,289,950,015
Newspapers, etc	778,428,515
Other articles	519,247,199
Articles sent free of postage	376,509,165
Articles of all kinds for foreign countries	41,273,312

From the organization of the post office department until 1816, the rate of postage on letters varied, according to distance, from 8 to 25 cents. In 1816, these rates were changed so as to vary from 6¼ cents to 25 cents; and in 1845 the rate was reduced to 5 cents for each letter not exceeding ½ ounce in weight, and 5 cents for each additional ½ ounce or fraction thereof, carried for a distance under 300 miles; over 300 miles 10 cents. In 1851, the rate was made 3 cents for all distances under 3,000 miles, if prepaid, and 5 cents if paid on delivery. In 1855, a law was passed requiring all letters to be prepaid; and, in 1863, the rate was made uniform to all offices in the United States; and by act of congress, approved March 3, 1885, the rate was still further reduced to 2 cents for each ounce or fraction thereof, carried to any part of the United States or territories. The same rate is charged for drop letters where there is free delivery by carriers; where there is no such delivery, only one cent is charged.

Mailable matter is divided into four classes, of which letters and any matter sealed against

inspection constitute the first class. The second class embraces newspapers and all other periodicals issued regularly at least four times a year. The postage on matter of this class is one cent a pound, except that such periodicals may be sent to actual subscribers, living in the county where they are published, free of postage. Matter in the third class includes books, transient newspapers, and, in general, all printed matter, not issued periodically; it also extends to proof sheets and manuscript copy accompanying the same, and, in general, to any paper, cardboard, or parchment, on which an impression has been made by printing or other mechanical process, except the copying press or typewriter. The postage on matter of this class is one cent for each two ounces or fractional part thereof. The fourth class includes articles of merchandise, and, in general, all mailable matter not belonging by its nature to either of the other three classes, and the rate charged on it is one cent an ounce. The limit of weight is four pounds. Matter belonging to the first, third, or fourth class may be registered on payment of eight cents in addition to the postage. In 1864, the money-order system was established at the leading post offices of the country, which has been a great convenience to the public. The following are the rates charged: For sums not exceeding $5, 5 cents; over $5 and not exceeding $10, 8 cents; over $10 and not exceeding $15, 10 cents; over $15 and not exceeding $30, 15 cents; over $30 and not exceeding $40, 20 cents; over $40 and not exceeding $50, 25 cents; over $50 and not exceeding $60, 30 cents; over $60 and not exceeding $70, 35 cents; over $70 and not exceeding $80, 40 cents; over $80. and not exceeding $100, 45 cents. A single money order may include any amount from 1 cent to $100. During the fiscal year ending June 30, 1891, the number of money orders issued was 11,451,274, covering the sum of $119,122,236; fees for same, $1,104,457.

In addition to the money-order system, the 3-cent postal note was authorized by congress in 1883, and is issued at the uniform charge of 3 cents for any sum from 1 cent up to $4.99. This note is payable to any person holding the same at any money-order office in the United States, within three months from the last day of the month in which it is issued. During the year ending June 30, 1891, the number of postal notes issued was 6,802,558, covering the sum of $11,753,849.28, the fees for the same being $204,076.24.

The number of post-offices in the United States authorized to issue money orders and postal notes, July 15, 1892, was 14,858, of which number 2,296 were also international money-order offices. There were at the same date 718 post offices authorized to issue postal notes only.

The one-cent postal card was first issued in 1873, large numbers of which are now used for brief communications. The two-cent card, with a "reply card" attached for the return of an answer, was first issued during the year 1892.

In 1864, the free-delivery system was introduced into the larger cities of the country, and it has since been extended to all towns and cities having over 10,000 inhabitants, or doing a post-office business of over $10,000. Provision has since been made for the extension of this system to villages and rural communities, and this has been accomplished to a limited degree. All post offices whose gross receipts amount to $1,000 or more are divided into three classes, first, second, and third, and are filled by presidential appointment; those whose receipts are less than $1,000 constitute the fourth class, and are filled by the appointment of the fourth assistant postmaster-general. The salaries of the postmasters appointed by the President vary from $1,000 to $6,000, according to the amount of business transacted. The salaries of fourth-class postmasters are derived from the percentage allowed on the sale of stamps, etc.

By the action of an international postal convention, which met at Berne, Switzerland, in 1874, the postage on all letters between the countries included in that union, as well as those that have since joined it, was fixed at the uniform rate of five cents on each letter weighing one half-ounce.

Among other improvements in the United States postal service that have been discussed but not yet adopted, are postal savings banks, the reduction of letter postage to one cent.

Potassium (*po-tas'si-um*), a bluish-white metal discovered by Sir Humphrey Davy in the year 1807. It is the lightest of all the metals except lithium, and as its specific gravity is only .865, it readily floats on water. In so doing it reacts violently with the water, forming caustic potash, and giving off hydrogen, which ignites spontaneously from the heat of the reaction. At the temperature of 32° Fahrenheit it is brittle, like glass; at 59° it is soft and malleable; at 144° it becomes liquid. Potassium is widely diffused in the vegetable, animal, and mineral kingdoms. Some of the more important potassium compounds are caustic potash (the hydroxide), the carbonate, the bicarbonate; also potassium chloride, bromide, iodide, nitrate (saltpeter), sulphate, chlorate, cyanide, etc. Of these iodide, bromide, and chlorate are used for medicines, the others being employed more or less in the arts.

Pota'to, the tubers of *Solanum tuberosum*, a genus of the nightshade family, which contains about 900 species, distributed almost everywhere, but most abundant in tropical America. Only about 25 of these species are found in North America. The potato, from which numerous cultivated varieties have originated, came from Chile, and is native in the mountains as far north as southern Colorado. The importance of these tubers as an

article of food is well known. It is sometimes called "Irish potato" or "white potato," to distinguish it from the "sweet potato," which belongs to a totally different plant. The cultivated varieties of potatoes are exceedingly numerous, and additions to the list are being made yearly. That this tuber is a modified stem is apparent from the so-called "eyes," which are buds appearing in the axils of minute scales. As is well known, these buds are able to develop into new plants, so that in planting the tubers care is taken in cutting them to include one or more eyes. In 1900, the acreage in the United States of potato-raising was 2,611,054 acres, and the value of the year's crop was estimated at nearly ninety-one million dollars. The total number of bushels in the gross yield was two hundred and ten million.

Pota'to Bug or **Pota'to Bee'tle,** a widely known beetle infesting potato vines. In twenty-five years it spread over the country, from the Colorado region to the Atlantic coast, and from Virginia to Maine. Up to 1859, this insect fed upon the sand-bur, a wild plant related to the potato, but, about that year, began to appear upon the potato vine. It multiplied rapidly and migrated eastward, causing extensive destruction, and, in 1874, had reached the Atlantic coast. It has been combatted with paris green and is now fairly well under control. The last part of its name (*Doryphora decemlineata*) refers to the ten dark lines on the wing covers.

Potential (*pō-tĕn'shal*), a term employed in physics, astronomy, and electric engineering. The region round about any attracting body where work has to be done to carry mass from one point to another is known as a field of force. The potential at any point in such a field of force is defined as the amount of work required to bring up a unit mass from infinity to that point. It is to be noted that nothing is here said as to the path by which this unit mass is brought up, for the work is the same whatever the path, provided the attraction obeys the law of inverse squares. This quantity was first introduced into physics by Laplace in his *Mécanique Céleste;* but the name, *potential,* is due to George Green (1828). The enormous importance of this quantity in electrical science will be appreciated best by reading some such treatment as J. J. Thomson's *Elements of Electricity and Magnetism.*

Poto'mac, a river of the United States, formed by two branches which rise in the Allegheny mountains in West Virginia, and unite 15 miles southwest of Cumberland, Md., from which point the river flows in a southeasterly course 400 miles, and empties into Chesapeake bay, after forming an estuary 100 miles long and from two to seven miles wide. A few miles above Washington, it forms a cataract, 35 feet high, and between this and Westport it falls more than 1,000 feet. The scenery in this portion of its course is wild and beautiful, especially where it passes through the Blue Ridge at Harper's Ferry. The Potomac forms a great part of the boundary line between Virginia and Maryland.

Potosi (*pō-tō-sē'*), a city of Bolivia, South America, nearly 50 miles southwest of Chuquisaca (Sucre). It is built on the side of the Cerro de Potosi, 13,000 feet above the level of the sea, and is one of the loftiest inhabited places on the earth. The streets are too steep or narrow for wagons or carriages, and fully one-half of the town is composed of tottering and ruined buildings, uninhabited and desolate. There are considerable changes in the climate, but it is generally very cold, owing to the snow on the surrounding mountains, which scarcely ever melts. Yet Potosi is one of the principal commercial towns of South America, the industry of the place being limited to silver mining. As the country near Potosi is very unproductive, all supplies have to be brought from a distance. The town was founded in 1545, and in 1611 had 160,000 inhabitants, but its population at the present time does not exceed 16,000. The department of Potosi is rich in minerals and cattle, and has an area of 52,100 square miles, and a population of 250,000.

Potpourri (*pō-pör-ē'*), the name of a mixture of sweet-scented flowers, dried and placed in a vase with a perforated lid, so that their odor may be diffused through the room in which they are placed. But it also signifies a dish of different viands, and corresponds in this sense to the *hotch-potch* of Scotland and the *olla podrido* of Spain. In music, the name is applied to a selection of pieces strung together without much system or arrangement—a sort of medley.

Pots'dam, the chief town of the Prussian province of Brandenburg, and second residence town of the royal family of Prussia, is situated on an island beside the river Havel, sixteen miles by rail from Berlin. It is a handsome city, with broad streets, public gardens, and fine squares, and in the neighborhood of the town are more than half a dozen royal palaces. The manufactories of Potsdam include sugar, chemicals, harness, silk, waxcloth, beer, etc. Flower gardening, especially of violets, is an active industry. The illustrious Alexander von Humboldt was a native of the place. Potsdam owes its creation as a town to the great elector Frederick William and to Frederick II. Prior to that period it was only a fishing village, built on the site of an ancient Slav settlement. Population 58,455.

Pot'stone, a mineral composed of a mixture of talc, mica, and chlorite. It is soft and easily cut when newly dug up, but becomes hard after exposure to the air. It is made into pots and other utensils, which are cleaned by the fire. It was well known to the ancients,

and Pliny describes the manner of making vessels of it. It is quarried in Moravia, Norway, Sweden, Greenland, etc.

Pottawat'tomies (signifying fire-makers), a tribe of North American Indians, belonging to the Algonquin stock. The early French settlers established a mission among them at Green Bay, Wis., and to this day many of them are Roman Catholics. They sided with the English both during the Revolution and in the War of 1812, and afterward settled in Kansas, where one band of over 400 now live in houses and cultivate the ground. Another band, 500 in number, is on a reservation in the same state, under the care of the Society of Friends.

Pot'ter, Alonzo, an American bishop of the Protestant Episcopal church, was born at La Grange, N. Y., July 10, 1800. He graduated at Union college in 1818, and a year later became a tutor in that institution, being afterward elected to the professorship of mathematics. Entering the ministry of the Protestant Episcopal church, he became rector of St. Paul's church at Boston in 1826, and in 1845 was chosen bishop of the diocese of Pennsylvania, a position which he filled with rare fidelity and efficiency, until he died at San Francisco, July 4, 1865. Among his works are *Political Economy*, *Religious Philosophy*, and *Handbook for Readers and Students*.

Pot'ter, Henry Codman, an American clergyman, was born at Schenectady, N. Y., May 25, 1835, and educated at Union college. His theological course was taken in the seminary at Alexandria, Va. His first service in the ministry was in a small village of Pennsylvania, from which charge he was called to St. John's Church, Troy, N. Y. After serving there and in Trinity, Boston, he was made rector of Grace church, New York city, where he remained until consecrated assistant bishop of New York, in 1883. In 1887, the death of his uncle Horatio, then bishop, placed upon him the whole responsibility of that office. He has published several works, among which may be mentioned *Sisterhoods and Deaconesses*, *The Gates of the East*, or a *Winter in Syria and Egypt; Sermons of the City*, etc. He has taken very prominent part in the attempts to purify the municipal politics of New York city and excited the animosity of those classes which are accused of sheltering vice for a remuneration.

Pot'ter, Paul, the greatest animal-painter of the Dutch school, was born at Enkhuizen in 1625, and was the pupil of his father, Pieter Potter, a landscape-painter, with whom he came to Amsterdam in 1631. He was also an excellent etcher and was so precocious that his best-etched pieces, *The Herdsman*, and *The Shepherd*, were finished when he was only eighteen years old. He established himself at The Hague in 1649, but in 1653 he returned to Amsterdam. He died there in 1654, at the untimely age of twenty-nine. His *Dairy Farm*, measuring 48¼ by 19½ inches, was sold in London in 1890 for $30,450, or $65 per square inch.

Pottery, a term applied to all objects made of baked clay. This art is of high antiquity, being practiced among various races in prehistoric times. We find mention of earthenware in the Mosaic writings. The Greeks had important potteries at Samos, Athens, and Corinth, and attained great perfection as regards form and ornamentation. Demaratus, a Greek, the father of Tarquinius Priscus, king of Rome, is said to have instructed the Etruscans and Romans in this art. The Arabs seem to be entitled to the credit of having introduced the manufacture of glazed ware into modern Europe. The Italians are said first to

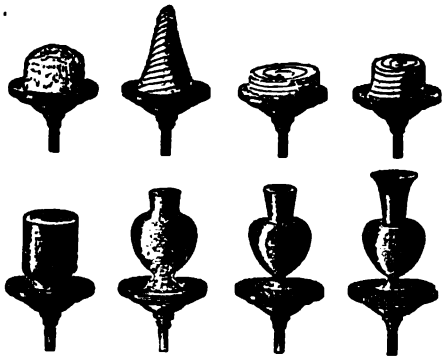
ETRUSCAN VASES.

have become acquainted with this kind of ware as it was manufactured in the Island of Majorca, and hence they gave it the name of *majolica*. They set up their first manufactory at Faenza in the 15th century. In Italy the art was improved, and a new kind of glaze was invented, probably by Luca della Robbia. The French derived their first knowledge of glazed ware from the Italian manufactory at Faenza, and on that account gave it the name of *faience*. About the middle of the 16th century the manufactory of Bernard Palissy at Saintes in France became famous on account of the beautiful glaze and rich ornaments by which its products were distinguished. A little later the Dutch began to manufacture at Delft the more solid but less beautiful ware which thence takes its name. The principal improver of the potter's art in Britain was Josiah Wedgwood in the last century. Porcelain or chinaware first became known in Europe about the end of the 16th century through the Dutch, who brought it from the East. In the United States the manufacture of pottery and porcelain is of recent development, but has already attained considerable dimensions, the leading establishments being located at Trenton, N. J., Cincinnati, Akron, and East Liverpool, O.

There are certain general principles and processes which are common to all kinds of pottery and porcelain. The first operations are connected with the preparation of the potter's paste, which consists of two different ingredients, an earthy substance, which is the

clay proper; and a siliceous substance, which is necessary to increase the firmness of the ware, and render it less liable to shrink and crack on exposure to heat. The clay is first finely pulverized, and reduced to the consistency of cream, when it is run off through a set of wire, gauze, or silk sieves into cisterns, where it is diluted with water to a standard density. The other ingredient of the potter's material is usually ground flints, or flint powder, as it is called, which treated in much the same way as the clay, is finally passed as a creamy liquor into a separate cistern. These liquors are now mixed in such measure that the dry flint-powder bears to the clay the proportion of one-sixth or one-fifth, or even more. The mixture is then forced into presses, lined with cloth, by means of a force-pump, the cloth retaining the clay and allowing the water to escape. The clay now forms a uniform inelastic mass, which is cut into cubical lumps and transferred to a damp cellar, where it remains until a process of fermentation or disintegration renders it finer in grain and not so apt to crack in the baking. It is then subject to another operation, called *slapping* or *wedging*, which consists in repeatedly breaking the lumps across and striking them together again in another direction, dashing them on a board, etc. This final process of incorporation is now most frequently performed by machinery.

In making earthenware vessels, if they are of a circular form, the first operation after the paste has been made is turning, or what is technically called *throwing* them on the wheel.



Successive Stages of Earthenware Vessel on the Potter's Wheel.

This is an apparatus resembling an ordinary turning-lathe, except that the surface of the *chuck*, or support for the clay, is horizontal instead of vertical. The chuck is in fact a revolving circular table, in the centre of which a piece of clay is placed, which the potter begins to shape with his hands. The rotary motion of the table gives the clay a cylindrical form in the hands of the potter, who gradually works it up to the intended shape. It is then detached from the revolving table and dried, after which, if intended for finely-finished ware, it is taken to a lathe and polished. It is at this stage that the handles and other prominent parts are fitted on, which is done by means of a thin paste of clay called *slip*. The articles are now removed to a room in which they are dried more thoroughly at a high temperature. When they have reached what is called the *green* state they are again taken to a lathe and more truly shaped, as well as smoothed and burnished. When the articles are not of a circular form, and accordingly cannot be produced by means of the wheel, they are either pressed or cast in moulds of plaster of Paris.

When shaped and dried the articles are ready for the kiln, in which they are exposed to a high temperature until they acquire a sufficient degree of hardness for use. After the kilns have been allowed to cool very slowly, the articles are taken out, and if they are not to be decorated in color, and sometimes also when they are to be so decorated, they are immersed in a composition called *glaze*, which, after the vessels have been a second time subjected to heat, is converted into a coating of glass, rendering the vessels impermeable to water.

There are two methods of printing on earthenware: press-printing, which is done on the bisque, and bat-printing, done on the glaze. In both cases an engraving is first executed in copper, and thence transferred, by means of a sheet of paper containing an impression, to the article requiring to be printed; but the processes are slightly different in detail. When the vessel has received its impression it is ready to be fired in the enamel kiln. Painting on earthenware is effected with a brush over the glaze.

Porcelain or chinaware is formed only from argillaceous minerals of extreme delicacy, united with siliceous earths capable of communicating to them a certain degree of translucency by means of their vitrification.

The processes employed in manufacturing porcelain wares are very much the same as those used for other kinds of earthenware, but requiring more delicacy and care. Metallic oxides incorporated with some fusible flux, such as borax, flint, etc., are used for painting on porcelain. The colors are mixed with essential oils and turpentine, and applied by means of a camel's-hair brush. When the painting is finished the vessels are baked in a peculiar kind of ovens called *muffles*, which are also used for fixing the printed figures on the glaze of stoneware. In order to secure the desired tint the baking must be stopped at precisely the proper time.

Potts'town, Pa., a borough in Montgomery county on the Schuylkill river and canal, and on the Philadelphia and Reading, and the Pennsylvania railroads, 18 miles southeast of Reading and 40 miles northwest of Philadelphia. Here are the plants of the Philadelphia Bridge company, and of the Pottstown Iron company, together with many

industrial establishments for the manufacture of nails, pig-iron, boilers, carriages, agricultural implements, cigars, etc. It has some schools, including the Hill school, the Normal institute, besides churches, libraries, banks, and other civil institutions. Population 13,696.

Potts'ville, Pa., a borough, the capital of Schuylkill county, on the river of the same name, in the rich anthracite coal regions of the state, 35 miles northwest of Reading, and 92 miles northwest of Philadelphia. It was at the Pottsville furnaces that hard coal was first successfully used for smelting purposes in 1839; it continues to be notable not only as a shipping-point for anthracite coal, but as an industrial center; there are rolling, spike, and planing mills, stove foundries, nut and bolt factories, machine and engine shops, silk, skirt, and stocking factories, breweries, etc. Population 15,710.

Poughkeepsie (*pō-kip'si*), a city of New York state and county seat of Dutchess county, is situated on the east bank of the Hudson river, 65 miles by rail from New York city. The Hudson is here crossed by a steam ferry and spanned by a railroad bridge of masonry, steel, and iron. Poughkeepsie is the largest town between New York and Albany; its manufactures include machinery, ironware, silks, boots and shoes, clothing, etc., and it has a rolling-mill, a blast furnace, and several breweries. Two miles to the north of the city, is the state hospital for the insane, which cost $750,000; but Poughkeepsie has chief reason to be proud of its educational facilities. The famous Vassar college is just beyond the eastern limits of the city, and the town also contains a collegiate institute, a business college, and a number of academies and seminaries, besides the public schools. Population 24,029.

Poul'try (Latin *pullus*, "a chicken"), the term used to designate the birds domesticated by man, usually embracing chickens, ducks, geese, turkeys, and guinea fowl. From the time when men began to abandon their wandering mode of life and settle down in fixed habitations, poultry in some form or other has taken the place of the wild birds which they are no longer able to snare and kill. Poultry are raised for the food furnished by their flesh and their eggs. Their flesh enters largely into the food-supply of the country, and is both healthy and nutritious. It has been estimated that the daily consumption of eggs in the United States is 50,000,000, which would represent an annual value of $200,000,000.

In France, where poultry are bred to so great an extent, — the sale of eggs amounting to about $30,000,000 annually, — there are no poultry farms, in the exclusive sense, but fowls are kept by every farmer and cottager. The same remark applies to Italy, Denmark, and Ireland, all of which export large quantities of both eggs and poultry. In the wine districts of France, fowls are permitted to wander among the vines nearly all the year round, and they do excellent service in cleaning off insects, as well as in manuring the ground. To make poultry profitable, they should be well housed and well fed, with sufficient space for obtaining gravel, grass, worms, garbage, etc. Their houses should also be kept clean, as the richness of their manure makes the ground very foul. For laying hens it has been found that soft food is very beneficial, and that it should be given in the morning, with hard corn in the latter part of the day. Sitting hens should have a quiet nest, where they will not be disturbed during the twenty-one days required for incubation. Artificial incubation has been very largely adopted by poultry raisers, most of the machines now sold working with great precision and regularity. The advantage of incubators is that they can be worked at all seasons of the year.

Pound, the English form of the Latin word, *pondus*, meaning weight, is now used in two distinct senses, *first*, a gold coin having the value of 20 shillings and, *second*, a standard of mass, equivalent to 7000. grains or 0.45359265 kilograms. The standard pound is not a "weight," but a "mass," and is kept at the Standard's office in London. The pound described above is the Avoirdupois pound; the Troy pound used only rarely by dealers in precious stones and metals has 5760. grains in it. (See Mass.) The old English pound, which is said to have been the standard of weight from the time of William the Conqueror to the time of Henry VII. was derived from the weight of 7,680 grains of wheat all taken from the middle of the ear and well dried. The pound weight of silver, the common money standard among the ancient Romans, was introduced by them into the countries which they conquered, and thus the term "pound" became the designation of a certain amount of coined money. The English pound is now considered as the simple equivalent in value of twenty shillings; but it originally denoted the actual pound of silver that was coined into twenty shillings. From the time of Edward II. the coins were more and more diminished in size until the reign of George I., when the pound (in weight) of silver was coined into 66 shillings; and this rate still continues, the term "pound" meaning 20 of these shillings.

Pout'er. See Pigeon.

Pow'derly, Terence Vincent, an American labor leader, who came into prominence as General Master Workman of the Knights of Labor, was born at Carbondale, Pa., Jan. 22, 1849. He entered the employ of the railroad as a switch-tender at the age of twelve, and as a machinist at nineteen. While in this latter employment at Scranton, he was elected secretary of the Machinists' and Blacksmiths'

union, retaining that office until 1880. He was a delegate to the International Union at Louisville, Ky., in 1874. He joined the Knights of Labor in that year and was elected mayor of Scranton in 1877, and again in 1878. He was raised to the chief office in the Knights of Labor at their meeting in Chicago in 1879, remaining master workman until succeeded by James R. Sovereign in 1893. It was through Mr. Powderly's persistence that the Knights of Labor became an open instead of a secret organization. He studied law and was admitted to the bar in 1894, and threw himself actively into politics as a Republican. He was appointed commissioner of immigration by the late President McKinley in 1897.

Pow'ell, John Wesley, an American geologist and anthropologist, was born at Mount Morris, N. Y., March 24, 1834, and served through the Civil war, in which he lost his right arm and rose to the rank of major. After filling the chair of professor in the Wesleyan university at Bloomington, Ill., for a number of years, in 1870 a survey of the Colorado river and its tributaries was placed under his direction by act of congress. While engaged in this service he gave special attention to ethnology, and in 1879 was made director of the new bureau of ethnology; in 1881 he was also appointed director of the United States Geological survey. Major Powell received the degree of doctor of philosophy from Heidelberg in 1886, and the degree of doctor of laws from Harvard in the same year; and in 1887 was president of the association for the advancement of science. His works include *Explorations of the Colorado River*, *Lands of the Arid Region of the United States*, *Studies in Sociology*, *Contributions to North American Ethnology*, and *Outlines of the Philosophy of the North American Indians.*

Pow'er, a term used in physics and engineering to denote the *rate of work.* When an engine hoists a carload of coal from the bottom of a pit to the surface of earth, it does the same amount of work whether the hoist be made in one minute or in one hour. Yet there is a very great difference between these two cases; and we say that it requires a much more "powerful" engine to make the hoist in one minute. Accordingly, we define the *power* of an agent as the rate at which it does work, that is, the ratio of the work divided by the time. *Activity* is used as a strict synonym for power.

The *unit of power* most frequently employed in England and America is the "horse-power," introduced by James Watt and defined as the activity of an agent capable of raising 550 pounds through a vertical distance of one foot in one second. The French horse-power is such that it will raise 75 kilograms one meter per second. In purely scientific work the unit of power is that which will accomplish the work of *one joule per second.* This unit is called a *watt;* and is numerically equal to 10^7 *ergs per second.* In electrical work, the kilowatt, or one thousand watts, is the unit most frequently used. Electrical energy, whether for lighting or for power purposes, is sold at so much "per kilowatt-hour." It is important for the student to remember that one horse-power is equal to 746 watts.

Pŏw'ers, Hiram, a distinguished American sculptor, was born at Woodstock, Vt., July 29, 1805. While still a boy he went to Cincinnati, O., where he became an apprentice to a clock maker, and about the same time formed the acquaintance of a German sculptor, who taught him to model in clay. In 1835, he went to Washington, where he executed the busts of several distinguished persons. Two years later, he went to Italy to study his art, and resided in Florence until his death, which took place June 27, 1873. There he produced his statue of *Eve*, and numerous other works; but the famous production of his genius was the *Greek Slave*, of which six copies in marble and innumerable cast copies were produced.

Powhatan (*pow-ha-tăn'*). See POCAHONTAS.

Poyn'ter, Sir **Edward J.,** an English artist, was born at Paris, March 20, 1836. His father was an architect and his great-grandfather a well-known sculptor. He was a student at Brighton college, and even while an undergraduate was interested in art. It was while spending a winter in Madeira for his health (1852–53) that he determined to devote his attention wholly to art. Going to Rome soon after, he was encouraged by those he met; and in 1856 he pursued his studies in Paris at l'École des Beaux-Arts. In 1859 he exhibited at the British institution his *Pifferari*, the painting receiving much praise. During the following years his pictures were exhibited in the chief salons of Europe, and in 1871 he was elected professor of art at University college, London. Having been for some time a member of the Royal academy he was elected to its presidency in 1896, invested with the insignia of office, and knighted at Windsor, Nov. 26 of that year. Among his most celebrated paintings perhaps the best known is his *Atalanta's Race* (1876), but his mosaics in the house of parliament at Westminster have attracted favorable attention. He has made numerous stained windows, designed coins, etc., and he wrote and published *Ten Lectures on Art.*

Pozzuoli (*poz-zu-ō'lē*), a city of southern Italy on the bay of Naples, seven miles from the city of Naples, with which it is connected by a tramway. Pozzuoli is particularly interesting from its memorials of ancient times. Its cathedral was the temple of Augustus. There are the remains of an amphitheatre which seated 30,000 persons, and in which

Nero fought as a gladiator; also remains of temples to Diana and Neptune, and of the ancient harbor of Puteoli. Some of the pillars of the temples of Serapis, still standing, are much eaten into by the water animals, which form holes in solid rocks in which they lodge themselves, showing that this volcanic coast was for a considerable time submerged to a depth of several feet below the sea level, and subsequently upheaved again. Part of the ruins of the temple are still under the sea level. Population 13,000.

Præ'tor, the title given to the consuls of ancient Rome as leaders of the armies of the state; but it was specially employed to designate a magistrate whose powers were scarcely inferior to those of a consul. The prætor's functions were chiefly judicial, his principal business (although he sometimes commanded armies in the field) being the administration of justice in matters both civil and criminal; and to the edicts of successive prætors the Roman law owes much of its development. Originally, there was but one prætor; but in 246 B. C., a second prætor was appointed to settle disputes that might arise between Romans and foreigners temporarily residing in Rome. In 227 B. C., two new prætors were appointed to administer affairs in Sicily and Sardinia, and a few years later, two for the Spanish provinces. Sulla increased the number to eight and Julius Cæsar to sixteen.

Præto'rian Guard, a special body of soldiers organized for protecting the person and upholding the power of the Roman emperors. We read of a select guard of soldiers attached to the person of Scipio Africanus, but it was by Augustus that they were first organized as a separate force. He formed nine or ten cohorts of 1,000 men each, but kept only three of them at Rome. Tiberius, however, assembled the nine cohorts in a permanent camp at Rome, while Vitellius increased their number to sixteen cohorts. They soon acquired great power, which they exercised often in a most unscrupulous manner, elevating and deposing emperors at their pleasure. Candidates for the imperial dignity found it necessary to bribe them largely; while those who attained the position were accustomed to purchase their favor by liberal donations. After the death of Pertinax (193 A. D.) they sold the imperial purple to Didius Julianus for a sum of money; but in the same year their organization was broken up by Severus, who formed new cohorts out of the best legions serving on the frontiers, which he increased to four times the number of the old. After several other changes the prætorian guard was finally dispersed among the other Roman legions by Constantine the Great in the year 312.

Pragmat'ic Sanc'tion, a solemn ordinance of the head of a kingdom relating either to affairs of church or those of state. The term originated in the Byzantine empire, and signified a public and solemn decree by a prince, in distinction from the simple rescript, which was a mere declaration of law in answer to an individual. This name is applied to several important treaties, of which the chief ones are (1) that of St. Louis in 1269, and (2) that of Charles VII. in 1437, in both of which the rights of the Gallican church were asserted; (3) the instrument which settled the empire of Germany in the house of Austria in 1439; (4) the ordinance by which Charles VI., emperor of Germany, settled his dominions on his daughter, the archduchess Maria Theresa; (5) the settlement of the succession of the kingdom of Naples, which was ceded by Charles III. of Spain, in 1759, to his third son and his descendants.

Prague, the capital of Bohemia, and the third largest town in Austria-Hungary, is situated on the Moldau, 220 miles from Vienna, and 120 from Dresden. It offers a highly picturesque appearance, from the beauty of its site and numerous towers, more than 70 in number, which rise above the many noble palaces, public buildings, and bridges of the city. The fortifications have been gradually demolished since 1866. The university, founded in 1348, received a new constitution in 1881, and now has two coordinate sides or sections, one German and one Czech, with 1,100 and 2,600 students, respectively. At Prague there is also a government technical high school, with 1,300 students, and teachers of both nationalities, German and Bohemian. The city has at various times been ravaged by wars, and here peace treaties have been enacted, notably that of 1635 between Ferdinand II. and the Elector of Saxony, and that of 1866 between Prussia and Austria, when the latter ceded to Prussia her rights in Schleswig-Holsten, and paid her a war indemnity of fifteen million dollars. Population 190,000.

Prai'rie (French, a "meadow"), the name by which the French explorers called the great fertile and treeless plains lying between Ohio and Michigan on the east, and the desert plains on the west. They embrace the western part of the state of Ohio, nearly all of Indiana, Illinois, and Iowa, the southern part of Michigan, the northern part of Missouri, and parts of Wisconsin, Kansas, and Nebraska. These prairies vary from 100 to 1,000 feet in height. At Cairo, Ill., they are from 400 to 550 feet above the sea, while near the center of the state they average from 650 to 750 feet, and in the northern part they are from 800 to 900 and even 1,000 feet. In southern Wisconsin, the highest points are 1,100 feet above the sea, while near Prairie du Chien the prairies are only 400 feet high. In Iowa, the prairie tableland of Nicollet is from 1,400 to 1,500 feet above the sea, and divides the waters of the Missouri from those of the Mississippi. The prairies on the headwaters of the Illinois and Wabash rivers,

and south and west of Lake Michigan, are called flat, because very smooth and level, while the regions broken by depressions of streams are rolling prairies. Trees are seldom seen west of the Mississippi, and near the 98th meridian they disappear altogether. East of the Mississippi, they are found in scattered groves along the streams, or on low, rocky ridges. Prairies have almost no stones, the soil being a vegetable mould, black and very rich, producing wonderful crops of corn and wheat. The mound prairies near Puget Sound, and elsewhere along the Pacific coast, are thickly studded with earth mounds, from three to four feet in height, and from 30 to 40 feet in diameter at the base. The vast plains lying between the 99th and 104th meridians, and reaching from the Big Horn mountains south to the Llano Estacado, are arid and partly desert, although by irrigation they have recently been developed into fertile fields.

Prai'rie Dog, a species of marmot belonging to the ground squirrel family. The animal is in no sense a dog. They inhabit burrows on the western plains and prairies, throwing up hillocks, which often cover a large territory, making a "village." On the approach of travelers, the animals are seen perched, often erect, on their hillocks. There are two species, one living east and one west of the Rocky mountains; they are about a foot long, and their fur is of a pale chestnut brown color. They prefer sandy or gravelly soil, and make underground galleries of great extent. They feed on buffalo-grass. The small burrowing owl and a rattlesnake have been found in their burrows, but it is not now believed that this association is from choice, or is it harmonious.

Praxiteles (*prax-it'e-lēs*), one of the greatest sculptors of ancient Greece, of whose life little is known except that he was a citizen of Athens in the 4th century B. C. His principal works, most of which have perished, were statues of Aphrodite, Eros, Dionysius, Apollo, and Hermes carrying Dionysius. Feminine beauty and Bacchic pleasures were his favorite subjects, and in his treatment of these he displayed the greatest sweetness, grace, and naturalness. He has been justly called the sculptor of the beautiful.

Preces'sion, is the name given to the slow motion of the earth, which causes the equinoxes to recede slowly along the ecliptic (apparent path of the sun around the earth), so that the sun comes to them in its annual revolution a little *earlier* than it otherwise would. The cause of this motion is the attraction of the sun and moon upon the protuberant part of the earth about the equator — the equatorial diameter of the earth being 26 miles longer than the polar diameter. The moment of force thus exerted tends to tilt the earth, which, like a top, "precesses" instead of falling over. As this disturbing force on the earth is very small relatively to its mass, this turning of its axis about the pole of the ecliptic takes place at about the rate of 50.1″ per annum, and it therefore requires 25,868 years for the equinoxes to describe a complete circle on the ecliptic. See TOP, EARTH, and POLE STAR.

Pre'cious Stones. See STONES, PRECIOUS.

Pre-emp'tion. Under the laws of the United States, an actual settler on the public lands enjoys the right, in preference to any one else, of purchasing at a fixed price the land on which he has settled, to the extent of 160 acres. In the case of "offered" lands, the settler must file his "declaratory statement" within thirty days after entry, and within a year proof must be made of settlement and cultivation, and the land paid for at $1.25 per acre, if outside the limits of a railroad grant, or $2.50 if within such limits. If the tract settled on is "unoffered," an approved plan of the township must first be received at the district land office; the statement must then be filed within three months, and final proof and payment be made within thirty months thereafter. Title to land is thus obtained much sooner than under the homestead laws; but a homestead settler may at any time after six months purchase the land under the pre-emption laws; as, on the other hand, the holder of a pre-emption claim may convert it into a homestead.

Pren'tice, George D., a distinguished American journalist, was born at Preston, Conn., Dec. 18, 1802, and graduated at Brown university in 1823. After studying law and editing the *New England Review* for two years, in 1831 he became editor of the Louisville (Ky.) *Journal*, which position he continued to hold until his death in the year 1870. The *Journal* became famous under his editorship as an organ of the Whig party; and during the war it gave an unflinching support to the cause of the Union. Prentice's witty paragraphs also constituted a feature of the paper much noted and admired. He published a selection of these paragraphs in the year 1860, the title of the book being *Prenticeana*. He also achieved considerable reputation as a public lecturer, and was the author of a number of short poems. After his death, the Louisville *Journal* was consolidated with the *Courier* of the same city, under the name of the *Courier-Journal*.

Pre-Raph'aelitism, a term used by Holman Hunt, J. E. Millais, and W. M. Rossetti, three English painters of the 19th century, to denote their predilection for the great masters before the time of Raphael, who studied nature rather than technical rules and dogmas. The three artists above named as representatives of the pre-Raphaelite school, appeared in the exhibition season of 1849, Millais with *Lorenzo and Isabella*, Hunt with *Rienzi*, Rossetti with *The Girlhood of the Virgin*, and excited the most flattering attention; but

numerous critics and enemies arose, and in the third year of its existence the new school was threatened on all hands with the most powerful opposition. Happily, however, there appeared in the London *Times* three letters from Ruskin denouncing the spirit of jealousy and injustice with which the young men had been assailed, and pointing out the merits of their works, and the great influence for good which the revival of their principles was likely to have. There followed later a succession of pictures from the three artists, whose titles have become as familiar as household words.

Pres'burg, a town of Hungary, stand son the left bank of the Danube, 40 miles by rail from Vienna and close to the Austrian frontier. Its principal buildings are the cathedral, in which the kings of Hungary used to be crowned, the town house, the parliament house, etc. The chief manufactures are beer, dynamite, wire, starch, spirits, confectionery, etc. Presburg, or to give it the Czech name, Pozsony, was a prominent town during the 11th and 12th centuries, and was frequently chosen for conferences and meetings between the rulers of Austria and Hungary. From 1541 to 1784 it was the capital of Hungary. Population of the city, styled in Hungary Pozsony, 60,000.

Pres'cott, William Hickling, a distinguished American historian, was born at Salem, Mass., May 4, 1796, and graduated at Harvard college in 1814. During his college course his left eye was put out by a piece of bread playfully thrown by a fellow-student, and the other eye was soon sympathetically affected, so that he was obliged to live for several months in a darkened room. He next traveled in England, France, and Italy, married in 1820, and abandoned the study of law for literature, devoting himself to intense study, although he was able only to use his remaining eye a portion of the time. His first studies were in Italian literature; and it was not until 1826 that he entered on the work of his life, the study of Spanish history. After laboring with great patience for several years, in 1838 he issued his *History of Ferdinand and Isabella*, a work which at once gave him a brilliant reputation, both in America and in Europe, and was translated into French, Spanish, and German. In 1843, he published his *Conquest of Mexico*, and in 1847 his *Conquest of Peru*. In 1855, he published two volumes of his *History of Philip II.*, but before the third volume was completed he died of apoplexy at Boston, Jan. 28, 1859. Prescott's style alone would have given him great popularity; and to this day he is without a rival for clear and vigorous narrative and sustained power of color. He cannot be called a philosophical historian; but he is a master of narrative and incident, and there is not a dull passage in all his works. See his *Life*, by George Ticknor.

Pres'ident of the United States, the chief executive officer of the government, chosen by electors from the various states every four years. Nine Presidents — Washington, Jefferson, Madison, Monroe, Jackson, Lincoln, Grant, Cleveland, and McKinley have been chosen for two terms; but a third term, although not prohibited by the constitution, is practically prohibited by the popular prejudice against it. Any native male citizen of the United States over 35 years of age is eligible to the office of President. The salary of the office is $50,000 a year, but the President must receive no other emolument during his term from the United States or any state. He is commander-in-chief of the army and navy; has the power to grant reprieves and pardons for offenses against the laws of the U. S., except in cases of impeachment, and (by and with the advice and consent of the senate) to make treaties, appoint ambassadors, consuls, and all U. S. officers not otherwise provided for. Every bill which passes congress must have the approval of the President before it becomes law, unless two-thirds of both houses pass it over his veto. The President administers the government through heads of departments who are known as secretaries, and who constitute his cabinet. These officials are appointed by the President and confirmed by the senate. He also presents to congress, when it assembles, a comprehensive statement of the affairs of the nation, with suggestions as to such matters as need its action. See UNITED STATES, DEPARTMENTS OF.

Presidential electors are chosen by the states, each state being entitled to two electors at large, and one for each congressional district, the total number at the present time being 447. A majority of all the electors chosen is necessary to an election of President and Vice-president, and if no candidate receives such a majority the house of representatives must choose the President from the three highest numbers on the list, and the senate the Vice-president from the two highest. In the election of President by the house, the vote is by states, each state having one vote, and a majority of all the states being necessary to a choice. The two Presidents elected by the house of representatives were Thomas Jefferson in 1801, and John Quincy Adams in 1825.

The election of President and Vice-president — or rather the selection of presidential electors — occurs every fourth year, on the Tuesday after the first Monday of November; and on the second Monday of January following, these electors meet in the capitals of their respective states and cast their votes, and transmit the result of the same to the president of the senate. On the second Wednesday of February, the president of the senate counts the votes of all the states in the presence of both houses of congress and announces the result, and on the 4th of March thereafter, the persons so chosen for President

and Vice-president are inaugurated for the term of four years. In case of the death or disability of the President, the Vice-president becomes President, and assumes all the duties of the office during the term for which he was chosen Vice-president. If the office of President and Vice-president both become vacant, provision is made by law for filling the office of President from members of the presidential cabinet in the following order: (1) secretary of state, (2) secretary of the treasury, (3) secretary of war, (4) attorney-general, (5) postmaster-general, (6) secretary of the navy, (7) secretary of the interior, (8) secretary of agriculture.

The following is a list of the Presidents of the United States, with the years during which they filled the office: (1) George Washington, 1789–97; (2) John Adams, 1797–1801; (3) Thomas Jefferson, 1801–9; (4) James Madison, 1809–17; (5) James Monroe, 1817–25; (6) John Quincy Adams, 1825–29; (7) Andrew Jackson, 1829–37; (8) Martin Van Buren, 1837–41; (9) William Henry Harrison, March–April, 1841; (10) John Tyler (chosen Vice-president with Harrison), 1841–45; (11) James K. Polk, 1845–49; (12) Zachary Taylor, 1849–50; (13) Millard Fillmore (elected Vice-president with Taylor), 1850–53; (14) Franklin Pierce, 1853–57; (15) James Buchanan, 1857–61; (16) Abraham Lincoln, 1861–65; (17) Andrew Johnson (elected Vice-president with Lincoln in 1864), 1865–69; (18) Ulysses S. Grant, 1869–77; (19) Rutherford B. Hayes, 1877–81; (20) James A. Garfield, March—September, 1881; (21) Chester Allan Arthur (elected Vice-president with Garfield), 1881–85; (22) Grover Cleveland, 1885–89; (23) Benjamin Harrison, 1889–93; Grover Cleveland, 1893–97; (24) William McKinley, 1897–Sept. 1901; (25) Theodore Roosevelt (elected Vice-president with McKinley), whose term began on the death of McKinley, Sept. 14, 1901, and will expire March 4, 1905.

The following table shows the number of electoral votes allowed to each state since the census of 1890:—

Alabama	11	Nebraska	8
Arkansas	7	Nevada	3
California	8	New Hampshire	4
Colorado	5	New Jersey	10
Connecticut	7	New York	37
Delaware	3	North Carolina	10
Florida	3	North Dakota	2
Georgia	13	Ohio	23
Idaho	3	Oregon	4
Illinois	25	Pennsylvania	32
Indiana	15	Rhode Island	4
Iowa	13	South Carolina	9
Kansas	10	South Dakota	4
Kentucky	13	Tennessee	12
Louisiana	9	Texas	16
Maine	6	Vermont	4
Maryland	8	Virginia	12
Massachusetts	14	Washington	3
Michigan	14	West Virginia	5
Minnesota	9	Wisconsin	11
Mississippi	10	Wyoming	3
Missouri	16	Utah	3
Montana	3	Total	447

Press. See PRINTING.

Pres'sure, a term used in physics and in engineering to denote the force per unit area which a fluid exerts upon any surface. To obtain the total force which a fluid impresses upon any given surface we have, therefore, only to multiply the average pressure by the area of this surface. In pure science, the *unit of pressure* is that which exerts a force of *one dyne per square centimeter*. A larger, and often more convenient, unit is that which was adopted by the Paris congress of physicists in 1900, namely, one million dynes per square centimeter. This unit is practically exactly represented by the pressure exerted by a column of mercury 75 cm. high at sea level at O°C. This larger unit is called a *barye*. One barye = 10^6 C.G.S. units of pressure.

Pres'sure Gauge. See MANOMETER.

Preto'ria, the capital of the Transvaal, was formerly the seat of government of the South African republic, but was taken possession of by the British troops June 5, 1900. It was named after the Boer leader Pretorius. The town Pretoria lies 980 to 1,000 miles northeast from Cape Town, and 285 miles west from Delagoa bay. It is connected with both by railways. Its white population was estimated at 10,000 at the outbreak of the war with Britain. In 1896, the town was thoroughly fortified; and in 1899, the president of the republic sent an ultimatum to England demanding the withdrawal of all English troops from the neighborhood, and the submission of all questions at issue to arbitration. The troops from Pretoria immediately invaded the English colonies, and the war (elsewhere described) followed. See BOER WAR.

Pri'am, king of Troy at the time of the Trojan war, was the son of Laomedon and Strymo or Placia. The name means "the ransomed," and was given him on account of his having been ransomed by his sister Hesione from Hercules, into whose hands he had fallen. He was the husband of Hecuba by a second marriage, and had fifty sons, the best known of whom were Hector, Paris, and Troilus, and a daughter Cassandra. Priam is represented in Homer as too old to take an active part in the Trojan war, and only once appears on the field of battle. The oldest Greek legends are silent respecting his fate; but later poets, like Euripides and Virgil, say that he was slain by Pyrrhus when the Greeks stormed the city of Troy.

Prich'ard, James Cowles, English physician and ethnologist, was born at Ross, in Herefordshire, Feb. 11, 1786. After taking a thorough course in medical study and learning a number of foreign languages, in 1810 he commenced practice as a physician in Bristol. In 1813, he published *Researches into the Physical History of Mankind*, which at once gave him high standing as an ethnologist. The successive editions of this

work were further proofs of the zeal with which he continued his ethnological investigations. Being appointed a commissioner in lunacy, in 1845, he removed to London, where he died Dec. 22, 1848.

Pric'kle, a spiny outgrowth, such as those which occur on the stems of roses. They involve not merely the epidermis, but also more or less of the cortex beneath. See EMERGENCE.

Prim (*prēm*), **Juan,** a Spanish general, was born at Reus, in Catalonia, Dec. 6, 1814. He entered the army at an early age, and in 1843, on account of his services in overthrowing Espartero, he was made count of Reus and a general. In 1862, he was appointed to the command of the Spanish forces sent to Mexico, but soon withdrew his troops from the enterprise, his course being approved by the Spanish cortes when his reasons were given to that body. Failing in an insurrectionary movement in 1866, he fled to England and Brussels, but here he guided the movement that in 1868 overthrew the government of Queen Isabella. He was appointed war minister, with the rank of marshal, by Serrano, and soon became virtual dictator. In 1870, he selected Prince Leopold of Hohenzollern as Spanish king, which Napoleon III. made the pretext for his declaration of war against Germany. But as Leopold declined the crown offered to him, Prim prevailed on Amadeus, an Italian prince, to accept it; but on the day the new king landed in Spain, Dec. 28, 1870, Prim was shot, at Madrid, by an assassin, and died two days later.

Prime, Samuel Irenæ'us, Presbyterian minister and editor of the New York *Observer*, was born at Ballston, N. Y., Nov. 4, 1812, and graduated at Williams college in 1829. After studying theology at Princeton, he was ordained to the ministry and became pastor of a church on the Hudson river, opposite Newbury, N. Y. In 1840, he became the editor of the New York *Observer*, which position he held until his death, which occurred at Manchester, Vt., July 18, 1885. Besides his editorial writings, he published *Travels in Europe*, *Annals of the English Bible*, and numerous other works.

Prim'rose, a general name of species of the primrose family (*Primulaceæ*), but more specially applied to a species of the genus *Primula*, which includes about 150 species, most of which belong to the northern hemisphere. About 13 species are native to North America. The most common primrose of cultivation is the so-called Chinese primrose (*P. sinensis*), a downy house plant with enlarged calyx. The common "English cowslip," whose cultivated varieties are known as different kinds of "polyanthus," is *P. officinalis*. In the same family belong such forms as the beautiful "American cowslip" or "shooting star," and the very similar cultivated Cyclamen.

PRIMROSE.

Prince, a title given to the sons of kings, emperors, and other rulers, sometimes with a territorial addition, such as Prince of Wales, Prince of Orange, etc. In various parts of continental Europe, the title is borne by families of very high rank, but not possessed of sovereignty; but in England the term is restricted to members of the royal family. In a more general sense, the word "prince" is often used for any ruler or sovereign of a state.

Prince Ed'ward Island, the smallest of the provinces of the Dominion of Canada, is situated in the gulf of St. Lawrence and separated from New Brunswick and Nova Scotia by Northumberland strait. Cape Breton, to the eastward, shelters it from the boisterous Atlantic. The greatest length of the island is about 125 miles, its breadth varying from 4 to 34 miles. Total area about 2,000 square miles, with a population of about 55 to the square mile, or 103,258 in all. Although discovered by the Cabots, the island did not come into the possession of Great Britain until 1763. The surface is undulating, but never rises higher than 500 feet above the sea level. The soil is fertile, and all kinds of cereals, roots, and vegetables are raised. A natural manure, called mussel mud, formed from decayed shells of oysters, clams, and mussels, is found on the coasts of the island and is highly prized by the farmers. The coast line is a succession of bays and projecting headlands, the island being divided into three peninsulas by the three large bays of Egmont, Hillsboro, and Cardigan. Manufactures are not carried on to any large extent, although shipbuilding was an important industry previous to the substitution of iron and steel vessels for wooden ones. There is a government railway running from one end of the island to the other; there is also steam communication with the mainland, although it is sometimes interrupted in winter. In the Dominion senate the province is represented by four members, and in the house of commons by five. It has a government of its own, the local legislative assembly, with twenty-nine members, of which nine compose the

ministry or executive council, under a lieutenant-governor. Charlottetown is the capital and seat of government (population 12,080). The climate is temperate and healthy; the salubrity of the land is such that it is frequently called "the garden of the Dominion."

Prince of Wales is the title usually borne by the eldest son of the reigning sovereign of Great Britain. The monarchs of Wales during its independence were so designated, and upon its becoming a part of the realm of England the principality of Wales was bestowed by Henry II. upon his son, afterward Edward I. In 1343, the title was bestowed upon Edward the Black Prince, and from that time to the present the custom has been followed by each reigning sovereign of Great Britain. The title is not inherited but bestowed, and usually some time after the coronation of the sovereign. On the death of the Prince of Wales, the title has been transferred to the next heir apparent, if a male. An annuity of $200,000 was settled upon the Prince of Wales by 26 Vict. c. 1. By a statute, the Prince of Wales becomes a Knight of the Garter as soon as he receives the former title. The particular badge of the Prince of Wales is a design of three white ostrich feathers encircled by the ancient coronet of Wales, and accompanied by the motto "Ich dien" (I serve). This device is said to have been assumed by the Black Prince in 1346, when he took such a plume from John, King of Bohemia, whom he slew in battle. The origin of the motto has never been satisfactorily traced.

Prince'ton, a pleasant town in Mercer county, N. J., forty-four miles by rail from New York, and about the same distance from Philadelphia. On the 3d of January, 1777, it was the scene of a battle between the British under Colonel Mawhood and the Americans under Washington, in which the British were defeated. Here, the continental congress sat in 1773, and it was from Princeton that Washington dated his farewell address to his army. The place, however, is chiefly celebrated as the seat of the Presbyterian college of New Jersey, founded at Newark in 1746, but removed to Princeton in 1756. The second president of this college was Rev. Aaron Burr, father of Aaron Burr who afterward became Vice-president of the United States. Among its other presidents have been Jonathan Edwards and Dr. James McCosh; and among its graduates are some of the most distinguished names in American history. Since the Civil war the endowment has been largely increased, and the college now possesses five museums, two observatories, four laboratories, and libraries numbering 145,000 volumes. Princeton university has a faculty numbering about 100, with a student body of nearly 1,300. The Theological seminary, founded in 1812, has a full corps of professors and about 200 students. With this seminary is associated the fame of the *Princeton Review*, founded in 1825 and edited until 1872 by Dr. Charles Hodge, when it was united with the *Presbyterian Quarterly*, published in New York. Population of Princeton 3,899.

Prince'ton Univer'sity. The college of New Jersey, now known as Princeton university, was founded in 1746, being the fourth American college in date of founding. It was first opened at Elizabethtown in 1747, but the same year was removed to Newark and soon after to Princeton. Here in 1754–55 was erected the first college building, Nassau hall, famous as having been used as barracks, and as a hospital during the War of the Revolution. On Oct. 22, 1896, the 150th anniversary of the signing of the first charter, the title of Princeton university was assumed. The institution now includes the academic department, graduate department, and John C. Green school of science, including departments of civil and electrical engineering. Princeton has always held rank among the first educational institutions in the country. In the list of its instructors, past and present, and among its alumni are found the names of many distinguished men. Its present faculty numbers 91, with an attendance of 1,277 students.

Print'ing is the art of producing impressions from characters and figures on paper or any other substance, but in this article it is confined to the art of making impressions with movable types, which may justly be esteemed among the greatest of human inventions. But notwithstanding the importance of this invention, it is not certain to whom the credit of it belongs, as it is contested by the Holland-Dutch in favor of Lourens Coster, and by the Germans in favor of Johannes Gutenberg. The most general opinion would seem to be in favor of Gutenberg, but it is not unlikely that they both made the discovery at about the same time, which was during the first half of the 15th century. Between 1450 and 1455, Gutenberg printed a Bible, copies of which are still in existence, although exceedingly rare and valuable; and besides this Bible, some other specimens of work from his press at Mayence have been discovered. The Dutch at Haarlem preserve and show similar specimens of early printing by Coster. Mayence, Haarlem, and Strasburg were certainly the places where printing was done before the art was extended to Rome, Venice, Florence, and other European cities. The art was introduced into England in the year 1471 by William Caxton, who set up a press in Westminster Abbey.

The first printing press in the United States was set up in the house of the president of Harvard college at Cambridge, Mass., in the year 1639, and in 1674 another was established in Boston, after which other presses were gradually introduced throughout the colonies. Until the beginning of the 17th

century the press used was a screw press, with a contrivance for running the form of types under the point of pressure; force having been thus applied, the screw was relaxed and the form withdrawn, with the impression executed on the paper. The defects of this press were at length partially remedied by William Jansen Blaen, of Amsterdam, who invented a press in which the carriage holding the form was wound below the point of pressure, which was given by moving a handle attached to a screw, hanging in a beam having a spring, which spring caused the screw to fly back as soon as the impression was made. This kind of press, which was mostly of wood, continued to be used in every country in Europe, as well as in America, until the beginning of the 19th century. The first improvement on this press was made by the celebrated earl of Stanhope, who constructed a press of iron, and applied such a combined action of levers to the screw as to secure an easier and more efficient working. Numerous improvements succeeded this, the screw being dispensed with, and the pressure being effected by levers. The chief among these was the Columbian press, invented by George Clymer, of Philadelphia, in the year 1818.

Meantime, in the year 1811, Frederick König, a German printer, had invented a press in which the impression was given by a cylinder, the inking being done by rollers, and the paper being carried through the machinery on tapes. Mr. John Walter, of the London *Times*, was so favorably impressed with this method of printing that he engaged König to make a double cylinder press which should print two copies of a form at each revolution of the cylinder, but only on one side of the sheet. This press, which was completed in 1814, made about 1,800 impressions per hour, and was the first printing press in the world operated by steam power. A few years later, König invented an improvement on this press, in which the sheet, after an impression had been made on one side by one of the cylinders, was turned over to receive an impression on the other side by another cylinder; but the march of improvement did not stop here. The circulation of newspapers increased to such an extent that in 1855, Richard M. Hoe, of New York, brought out the rotary printing press, in which the pages of type were placed on a horizontal cylinder revolving on its axis, against which the sheets were pressed by a number of smaller cylinders, which were so arranged in a framework as to require a feeder for each one of these smaller cylinders. Such a press with six cylinders, each making 2,000 impressions an hour, could turn out 12,000 sheets, printed on one side, in an hour, and those with eight and ten cylinders in proportion. But the Hoe machine, with all its advantages, printed only one side at a time, and some years afterward — between 1863 and 1868 — the Walter press was devised, by which printing is done from a continuous roll of paper, which is printed on both sides from stereotype plates, cut in separate sheets and pasted. This press, when first introduced, printed from 12,000 to 15,000 sheets per hour; but since that time many other web-printing presses have been introduced, by which sheets of four pages are printed at the rate of 50,000 or more per hour. By the introduction of steam presses the trade of the printer has undergone a remarkable revolution in the past century, and although fewer hands are needed for working the presses in proportion to the amount of printing done than formerly, the increase of employment to compositors, bookbinders, etc., has been very great. The manufacture of printing machinery, as well as the manufacture of paper, has itself become a great industry, and no one can safely predict what progress will be made in this field during the present century. See *The American Dictionary of Printing and Bookmaking*.

Prism, an optical instrument composed of two plane refracting surfaces. The angle between these two planes is called the "refracting angle" of the prism. Since in any kind of matter, except ether, lights of different color travel with different speeds, it follows that lights of different color will each have a different direction impressed upon them on passing through a prism. A prism thus produces "dispersion" in a beam of white light and is used, therefore, in the spectroscope to separate the various colors which compose the incident beam. Any transparent material whose refractive index is desired is generally cut in the form of a prism; for on measuring the angle of deviation for any ray, call it D, and the refracting angle of the prism, which we may call A, we have the following relation: —

$$\text{Refractive index} = \frac{\sin\left(\frac{A+D}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

See articles LUXFER PRISM, SPECTROSCOPE, and LIGHT.

Pris'oners of War are persons captured from the enemy during military or naval operations. In ancient times, the treatment of prisoners of war was very severe, it being no uncommon thing to put the population of a conquered city or state to the sword, or to reduce them to slavery. Although the practice of putting prisoners to death became less frequent, as the principles of Christianity became more widely diffused, they and their families were commonly reduced to slavery as late as the 13th century. By degrees the more humane custom of exchanging and paroling prisoners was adopted, although in all wars there is still more or less suffering among prisoners. The miseries endured by Union soldiers at Andersonville and other southern prisons during the Civil war fur-

nishes the darkest chapter in the history of that conflict.

Pris'ons, strange to say, are a development of civilization, and also of personal liberty. The abolition of slavery and the decay of the feudal system made it necessary in all countries to take the punishment of crimes out of private hands and turn the offender over to the power of the state. In the exercise of this power the various governments have punished their subjects by death, direct torture, transportation, exposure in the pillory, etc. All these, except death, have been abandoned by most civilized nations; and in all of them the death punishment is inflicted only for the most serious offenses; and as a consequence, imprisonment for a greater or lesser period is resorted to as a means of protection to society. How crudely, how barbarously, this power has often been exercised has in part been revealed to the world — and, if the whole story could be told, how dark would be the picture! It is a relief to turn from the contemplation of the miseries and horrors of prison-life to the efforts that are being made by prison reformers throughout the world to reduce prison discipline to a humane system, and to make it a means of reformation to the prisoner, as well as a means of protection to the public. The prisons of the world are yet very far from perfection; but in every civilized nation there are earnest men and women studying all the questions connected with prison reform, and the results are already seen in a more intelligible and more Christian system of discipline. In the United States, especially, our jails and penitentiaries have been relieved of many degrading features, and in a number of the states "reform schools" have been established for juvenile offenders. In the year 1877, the state of New York established a reformatory at Elmira for the reception of all prisoners under thirty years of age, in which, while strict order and discipline are maintained, the inmates are carefully trained and educated and encouraged to earn a parole, and even a discharge, by good conduct and thorough reformation. In the state of Ohio, in addition to a "reform school" for girls at Delaware and a "reform farm" for boys at Lancaster, an "intermediate penitentiary" has been established at Mansfield, O., which is conducted after the manner of the Elmira reformatory. Similar steps have been taken in other states. See *The State of Prisons in the Civilized World*, by Wines.

Pri'vateer, a ship owned by a private individual, or by a number of individuals, which, under letters of marque, makes war upon the shipping commerce of a hostile power. Privateering was abolished among European nations, except Spain, by the treaty of Paris in 1856; but the United States has never signed this agreement. During the War of 1812, and to some extent during the Revolutionary war, British commerce suffered severely at the hands of American privateers, there being over 200 of these afloat during the War of 1812. In the Civil war, the Confederate privateer, the *Alabama*, captured a considerable number of United States merchant vessels, for which England afterward paid damages for allowing a privateer to depart from one of her ports. By act of congress, passed in 1864, the entire proceeds of a prize taken by a privateer go to the captors, unless otherwise provided and specified in the ship's commission, the sum awarded being divided equally between the ship's company and her owners.

Priv'y Coun'cil, an institution peculiar to the English government, having its origin in feudal times, when it was the custom of the sovereign to summon his barons and nobles to give him advice in matters of state. The list of privy councilors includes, besides the prime minister and members of the cabinet, the archbishops of Canterbury and York, the bishop of London, the lord chief-justice of England, the lord-chancellor, and numerous dignitaries. In ordinary cases, only the cabinet ministers, the great officers, and the archbishop of Canterbury, are summoned to the meetings of the privy council, but in extraordinary cases the whole body is summoned.

In theory, the cabinet is only a committee of the privy council, but, in point of fact, power is exercised by the cabinet alone, and the privy council is only occasionally consulted, or consulted rarely. The privy council cannot, however, be truthfully described as dead or obsolete, as it still exercises important powers in special cases. In 1788, it took on itself the duty of inquiring into the sanity of George III., and in 1821 it determined the constitutional question of Queen Caroline's right to be crowned as queen consort. Still, in a general sense, it may be described as a reserve force, kept apart from the active and working forces of the government.

Proa (*prō'a*) is a peculiarly shaped canoe used by the natives of the Malay archipelago and on the China seas, especially by the Ladrone islanders. It is about thirty feet in length by three feet in width, and has the stem and stern equally sharp, so as to change its course without being turned around. One side is flat and in a straight line with stem and stern; the other side is rounded like an ordinary boat. This peculiar formation would make it easy to upset, were it not for a framework which projects to windward and supports a weight which counterbalances the great pressure of the wind on the sail.

Proc'ter, Adelaide Anne, daughter of B. W. Procter, was born at London, Oct. 30, 1825, and died there Feb. 3, 1864. By her *Legends* and *Lyrics*, some of them being first written for *Household Words*, she won no small measure of poetical renown.

Proc'ter, Bryan Waller ("Barry Cornwall"), was born at London, Nov. 21, 1787. Educated at Harrow with Byron and Peel for school-fellows, he came to London, when about twenty years of age, and soon began to contribute poetry to the *Literary Gazette*. A few years later, he published four volumes of poems, and produced a tragedy at Covent Garden theatre, whose success was largely due to the acting of Macready and Kemble. He was a metropolitan commissioner of lunacy from 1832 to 1861, and died Oct. 4, 1874. His works, issued under the pseudonym of "Barry Cornwall," comprise *Dramatic Scenes*, *A Sicilian Story*, *Marcian Colonna*, *The Flood of Thessaly*, and *English Songs*, besides *Memoirs of Kean*, and *Charles Lamb*. Although "Barry Cornwall" cannot be assigned to a place in the front rank of literary genius, he will long be remembered as an author whom every one loved; in the language of Mr. Gosse "he has written more songs that deserve the comparative praise of *good* than any other modern [English] writer, except Shelley and Tennyson." See *Bryan Waller Procter, an Autobiographical Fragment*, edited by Coventry Patmore.

Proc'tor, Richard Anthony, a distinguished English astronomer, was born at Chelsea, England, March 23, 1837, and was educated at St. John's college, Cambridge, where he graduated in 1860. He published an article on "Double Stars" in the *Cornhill Magazine* for December, 1865, and from that time wholly devoted himself to the study of astronomy. He came to America on a lecturing tour in 1873, and again in 1875, where he succeeded, as he had previously done in England, in interesting large numbers of people in the science of astronomy. He died at New York, Sept. 12, 1888; and in 1890 a memorial observatory was erected in his honor near San Diego, Cal. Among his numerous works are *Half-Hours with the Telescope*, *The Sun*, *The Moon*, *Other Suns than Ours*, *Old and New Astronomy*, *Light Science of Leisure Hours*, and *Myths and Marvels of Astronomy*.

RICHARD A. PROCTOR.

Prometheus (*prō-mē'thūs*), a hero of Grecian mythology, who, on account of various services rendered to men, was chained by Zeus to a rock, where a vulture was sent to devour his liver by day, Zeus causing it to grow again by night. As Prometheus continued to endure this torture without yielding, the wrath of Jupiter was at length appeased, and the victim was released. Some legends represent the offense of Prometheus as stealing fire from heaven for the benefit of men; and in the tragedy of Æschylus he is an immortal god, a friend of the human race, who does not shrink from opposing the evil designs of Zeus against mankind, and even from sacrificing himself for their salvation. The possession of fire was very important to the early races of men, and the legend of its having been originally stolen from heaven is very widely spread over the world.

Prosenchyma (*prŏs-ĕn'kĭ-ma*) (in plants), a tissue in plants whose cells are elongated or fibrous. It is a general name covering all elongated and fiber-like cells, as distinct from "parenchyma," which is a tissue composed of cells whose three diameters are approximately the same.

Proserpina (*pro-ser'pi-na*), daughter of Zeus and Demeter. While gathering flowers on the plains of Sicily, she was abducted by Pluto and taken to his abode in the underworld, where she was found by her mother after a nine-years' search, and given up by Pluto only on condition that she should live part of the year underground. The myth is very clearly an expression of the revival of nature every year, after winter is over.

Protagoras (*prō-tag'ō-ras*) the earliest of the Greek sophists, was a native of Abdera, born about 481 B. C. The basis of his philosophy is the proposition that "man is the measure of all things." All his works are lost, and he himself perished at sea while on his way to Sicily to escape a charge of atheism brought against him at Athens. He died about 411 B. C.

Protandry (*pro-tăn'drĭ*), (in plants), a condition in which the stamens are mature and shedding pollen before the stigma of the same flower is ready to receive it. See POLLINATION.

Protec'tion is the aid given by government to particular industries by bounties, or by taxation of other industries, or more commonly by tariff or import duties on foreign products. See POLITICAL ECONOMY.

Protec'tor, a title which has sometimes been conferred on the regent or governor of the kingdom during the minority of the sovereign. Oliver Cromwell, in 1653, took the title of lord-protector of the commonwealth of England, Scotland, and Ireland, and ruled over those countries under that title until his death, in 1658.

Prot'estantism, a term derived from the *protest* of Luther and his adherents against the decree passed by the Catholic states at the second diet of Speier, in 1529. The principles involved in this protest were, that the Catholic church has no authority over the Reformed church, that the authority of the Bible is supreme and above that of bishops

and councils, and that it is to be interpreted, not according to tradition, but by its own language. The right of private judgment in reference to the interpretation of the Scriptures is the principle of Protestantism that especially distinguishes it from Roman Catholicism. Protestant churches are divided into numerous branches, with wide differences of doctrine and forms of worship, but they all agree in the assertion of independence of the Roman See.

Proteus (*prō'tē-us* or *prō'tūs*), in the oldest Greek mythology, appears as an "old man of the sea," who tends the seal flocks of Neptune, his father, and is endued with the gift of prophecy. His favorite residence, according to Homer, is the island of Pharos, near the mouth of the Nile. Here he rises at midday from the floods, and sleeps in the shadow of the rocky shores, surrounded by the monsters of the deep. But when caught by persons who sought to have him foretell future events, he would try to escape by assuming all manner of ugly shapes and disguises, and would refuse to exercise his gift until he found that further resistance would be useless.

Prothallium (*prō-thăl'lī-ŭm*), among plants, is a name applied in a general way to the gametophytes of Pteridophytes and Spermatophytes. It specially belongs, however, to the ferns, in which the prothallium, often written "prothallus," is a quite distinct but very small green and notched thallus. Upon the under side of this small body the antheridia and archegonia occur. From the fertilized egg within the archegonium the ordinary leafy fern plant arises. When in other plant groups the prothallium ceases to be independent, as in seed plants, it often retains the name. For example, many would speak of the female gametophyte (endosperm) found in seeds as a female prothallium. See GAMETOPHYTE.

Protococcus (*prō'tō-kŏk'kŭs*), a genus of plants which are among the simplest of the green algæ. The mature plants are single spherical green cells, which occur in masses. See CHLOROPHYCEÆ.

Protogyny (*prō-toj'ĭ-nĭ*) (in plants), a condition in which the stigma is ready to receive before the pollen of the same flower is ready for shedding. See POLLINATION.

Protonema (*prō'tō-nē'ma*) (in plants). When the asexual spores of mosses germinate they produce at first green branching filaments, which are prostrate and resemble ordinary green algæ. Upon this filamentous body the ordinary leafy branches arise. This alga-like body is known as the protonema. See MUSCI.

Protoplasm (*prō'tō-plaz'm*), the living substance in animals and plants. Huxley called it the "physical basis of life." It is the only substance endowed with life. It is very similar in animals and plants, and within it all living activities take place. It is a jelly-like, colorless substance, appearing finely granular under the microscope. It is composed of two parts, one more solid, which stains deeply with dyes (*chromatin*), and a fluid part (*achromatin*), which stains very faintly or not at all. The discovery of protoplasm, and the gradual appreciation of the part it plays in the living world, is one of the greatest scientific advancements of the nineteenth century. In 1835, Dujardin, a French naturalist, was studying the simplest animals (*Protozoa*) under the microscope. He observed that their bodies were composed of a sort of transparent jelly, that moved and contracted and showed evidences of being alive. This soft jelly-like substance he called *Sarcode*, and described it as living matter endowed with life. Some years after, in 1846, Hugo von Mohl, a botanist, called attention to the viscid contents of plant cells, for which he proposed the name *protoplasm*. This name had previously been used, in 1840, by Purkinje, for animal substance, but Von Mohl first brought it into general use. Presently, naturalists began to suspect that the *sarcode* of the zoologists, and the *protoplasm* of the botanists, were essentially identical in nature. This was definitely maintained by Cohn in 1850. Finally, in 1860, Max Schultze placed the matter on a secure basis, and applied the term protoplasm to all living substance, either animal or vegetable. This led to what is known as the protoplasm theory, which absorbed the cell theory of Schleiden and Schwann. By Max Schultze the cell was defined as a mass of protoplasm surrounding a nucleus. Although protoplasm is so similar in appearance and reactions in all living beings, nevertheless, there must be unperceived differences — possibly not of kind but of degree of modification. See CELL DOCTRINE.

Protozoa (*prō'tō-zō'a*), the simplest animals. Collectively, they form the sub-kingdom protozoa. They are microscopic and unicellular, and are abundant in stagnant water. They are of great interest to zoologists and physiologists because, in them, the processes of life are reduced to their simplest expression. By studying them, many facts are obtained that help in understanding the more complex animals. They have recently been studied in reference to their reactions to stimuli, and many important results obtained. The daily life of a protozoon was made the subject of study in one of our laboratories of psychology. The group includes simple forms like the amœba and its relatives, having root-like feet, and constituting the class *Rhizopoda*. Many of the rhizopods have no covering, but others either secrete a shell, or gather hard particles and build one. Chalk is largely made up of minute limy shells of protozoa. The form most common in chalk

is a cluster of globular chambers, varying in size. The walls of these shells are perforated by minute holes, through which the soft protoplasm of the animal protrudes. They constitute an order called foraminifera or hole-bearers. These animals are abundant in warm and temperate seas. They live near the surface and, as they die, their shells sink of their own weight and reach the bottom. Deep-sea explorations have brought from great depths a soft ooze, formed almost entirely of these shells of foraminifera. Somewhat similar forms make shells of great beauty, of quartz or silica, which cannot be dissolved by acid or melted by fire. They constitute the order *Radiolaria*. The higher protozoa belong mainly to the class *Infusoria* (which see). These minute animals have hair-like processes (*cilia*), which propel the body through the water like the action of many small oars. In some forms, the hair-like threads are large, and reduced in number to one or two, and are called flagella. Thus the class infusoria is separated into two divisions, the *Flagellata* and the *Ciliata*. The latter contains the highest developed of the protozoa. Among the more common forms may be noted: the slipper animalcule (*Paramœcium*), with a free swimming slipper-shaped body; the bell animalcule (*Vorticella*), with a bell-shaped body anchored by a stalk, and the trumpet animalcule, or stentor. The rhizopoda and the infusoria are the chief classes; two others of less importance are recognized. See Leidy's *Fresh Water Rhizopods of North America* (1879), beautifully illustrated, published by the United States government; and Kent's *A Manual of the Infusoria* (1880–82).

Provencal (*prō'von'sal'*) **Language, The,** is one of the so-called Romanic languages, all of which are directly descended from the language of ancient Rome. Wherever Roman law, Roman custom, and Roman trade established themselves, the language of Rome followed. In this way the inhabitants of northern Italy, Spain, France (Gaul), and parts of Switzerland, received a new tongue. The language which came into common use in these places, however, was the "low" Latin of the provinces, a colloquial form of the Latin tongue, lacking much of its grammatical precision. This "low Latin" mingling with the languages or dialects of the various places mentioned, produced, in time, a number of new languages having the same background, but little else in common. Writers distinguish six such Romanic languages: the Italian, the Moldavian, the Spanish, the Portuguese, the French and the Provençal, the latter a dialect language of the south of France, whose use extended from Lake Geneva to the bay of Biscay on the west, and south to the Mediterranean. This section of France had not only a language of its own, but a literature also, which in the 12th and 13th centuries was especially rich in poetry. It was in this language the songs of the troubadours were mostly composed, so that Provençal and troubadour are often used as synonymous terms. The conquest of southern France by northern France, in the 13th century, reduced the old Provençal tongue to the level of a mere dialect; nevertheless, its effect upon the language which has superseded it is marked, and the relation of the two affords a battleground for modern philologists.

Prov'erbs are very hard to define; but nearly everybody knows one when he sees or hears it. Perhaps the best description is that of Cipriano de Valera: "Proverbs are short sayings, sententious and true, and long since accepted as such by common consent." The distinctive characteristic of the proverb is that it is a popular current saying, adopted as a convenience by the community. It must indeed have shortness, sense, salt, pith, and other qualities, but it is also necessary that these should be so combined that it will strike the popular fancy, and thereby come into general use. It has been well said that no one man ever made a proverb. He may have made an original saying, but the proverb is a creature of popular suffrage. Not only is this the case, but they pass from one nation to another, and thus become the property of the race; and for this reason it is impossible to determine even the nationality of some of our best and most popular proverbs. The office of the proverb is to "hit the nail on the head," to "put the matter in a nutshell," to speak the last word, to settle the issue without further argument or discussion. Of all national groups of proverbs the Spanish contains the greatest number, some 25,000 or 30,000; and they are as racy as they are numerous. Among oriental proverbs, the Arabic hold the first place in quantity and perhaps also in quality; but the Persian and Hindustani are also excellent, and in the Turkish there is sometimes a vein of poetry that is very striking. It is a question whether the "tender beauty" of our proverb, "God tempers the wind to the shorn lamb," is not rivaled by its Turkish parallel, "God makes a nest for the blind bird."

Prov'idence, a seaport and capital of Rhode Island. It is the second city of New England in point of wealth and population, and an important center for manufacturing and shipping, and for its railroad and financial interests. It is celebrated for its manufacture of jewelry and silverware. It also produces tools, stoves, engines, locomotives, cottons and woolens, corset laces, shoe laces, lamp-wicks, etc., and has many bleaching works. It is situated at the head of navigation on an arm of Narragansett bay (called Providence river), 35 miles from the Atlantic, and 44 miles from Boston. Among the many notable public buildings and institutions of Providence are a city hall of granite, costing $1,000,000, with the state soldiers' monument

facing it; the state house, the custom house, and post office; the Athenæum, and the buildings of the Rhode Island Historical society; the Arcade and the Butler exchange; a great number of churches, schools, and libraries, hospitals and asylums, including a noble charity, known as the Dexter asylum for the poor; the Quaker college, and Brown university, a Baptist institution founded in 1764 and amply endowed. It has a faculty of 77 professors and lecturers, and 872 students, and ranks among the leading colleges of the United States. The college library embraces 110,000 volumes, besides some 30,000 pamphlets. Providence was settled in 1636 by Roger Williams. Population 175,597.

Prunes are the dried fruit of a certain variety of plum trees, largely prepared in France and exported from that country. Considerable quantities also come from Bosnia, Servia, and California.

Prun'ing, the removal of branches from trees and shrubs for purposes of ornament or to increase the production of fruit. Forest trees are sometimes pruned to increase the size of the trunk for timber purposes. In pruning it is necessary to understand the particular nature of the tree or shrub that is to be pruned, but it may be laid down as a general rule that the branches cut off should be small in proportion to the size of the trunk.

Prussia (*prush'i-ă*), the largest and most important state in the German empire, is bounded on the north by the German ocean, Jutland, and the Baltic; on the east by Russia; on the south by Austria, Saxony, the Thuringian states, Bavaria, Hesse-Darmstadt, and Alsace-Lorraine; on the west by Luxemburg, Belgium, and the Netherlands. The total area is 134,603 square miles, with a population of 34,463,377; that is, nearly two-thirds of the German empire in territory, with about three-fifths of the population. The frontier line has a circumference of 4,720 miles. About one-fifth of the present area of Prussia has been acquired since 1853, the largest gains being made after the victorious war of 1866. The greater part of Prussia belongs to the north European plain, while less than a third, chiefly in the southwest, can be described as hilly or mountainous. The northern plain is watered by five large rivers—the Niemen, Vistula, Oder, Elbe, and Weser—all of which rise beyond the borders of the kingdom, and also by the Pregel, Eider, and Ems, which are wholly Prussian. In the west, the chief river is the Rhine, which enters Prussia at Mainz (Mayence), and thence flows north through a narrow valley; it is navigable throughout its entire course in Prussia. The capital of Prussia, and also of the German empire is Berlin (population 1,884,151). The other chief towns of Prussia are Breslau (population 422,738), Cologne (Köln) (population 372,229), Frankfort-on-the-Main (population 288,489), Hanover (population 235,666), Magdeburg (population 229,663), etc.

Education is compulsory in Prussia between the ages of six and fourteen, its management and direction being under the control of the state. Prussia has ten universities, Königsberg, Berlin, Greifswald, Breslau, Halle, Göttingen, Münster, Bonn, Kiel, and Marburg, which number 1,500 professors and 21,000 students. In addition to the libraries of the universities, there is the Royal library at Berlin, with 800,000 volumes and 15,000 manuscripts. Among the numerous scientific and literary schools and societies of Prussia are the Academy of Arts, the Royal Museum of Arts, the Academy of Sciences, etc.

In 1900, the strength of the Prussian army on a peace footing was 465,000, of whom 54,000 were cavalry and 73,000 artillery. Every able-bodied Prussian between 20 and 39 years of age, is liable to be called on to serve, clergymen of the Roman Catholic and Evangelical churches and indispensable supporters of families being exempt. For the history of Prussia, especially since her successful wars with Austria in 1866, and with France in 1870, at which latter date King William I. became the then emperor of Germany. The present king of Prussia, who is also German Emperor, is William II., who came to the throne on June 15, 1888. See GERMAN EMPIRE.

Pruth River, an affluent of the Danube, rises in Austrian Galicia, on the northeast side of the Carpathian mountains, and flows eastward past Kolomea and Czernowitz. Length about 520 miles.

Pseudonym (*sū'dō-nim*) (Greek *pseudes*, "false," and *onona*, "name"), a false or assumed name adopted by an author, which conceals his identity. In recent times young authors, especially, have frequently risked the publication of their first work under a pseudonym—otherwise called *nom de plume*—and have kept it up afterward, and this to such an extent that the real name of the author is, in some cases, almost unknown to the general public. For instance, the name of *George Eliot* is familiar to book readers on both sides of the Atlantic; but few would recognize a work by Marion Evans, her maiden name. Among the famous pseudonyms of the 19th century we may mention *Currer Bell*, Charlotte Brontë; *Hosea Biglow*, James R. Lowell; *Bystander*, Goldwin Smith; *Boz*, Charles Dickens; *Pisistratus Caxton*, 1st Lord Lytton; *Grace Greenwood*, Mrs. Lippincott; *H. H.*, Helen Hunt Jackson; *Gail Hamilton*, Mary Abigail Dodge; *Marion Harland*, Mrs. M. V. Terhune; *Orpheus C. Ker*, R. H. Newell; *Owen Meredith*, Earl of Lytton; *Petroleum V. Nasby*, D. R. Locke; *Ouida*, Louise de la Ramé; *George Sand*, Madame Dudevant; *Timothy Titcomb*, J. G. Holland; *Mark Twain*,

Samuel L. Clemens; *Josh Billings*, Henry W. Shaw; *Uncle Remus*, Joel Chandler Harris; *Artemus Ward*, Charles F. Brown, etc.

Psyche (*sī'kē*). According to Grecian mythology, Psyche was the youngest daughter of a king, and was so lovely that she aroused the jealousy of Venus, who sent Cupid to the maiden to inspire her with love for the basest of men; but Cupid himself was so impressed with her charms that he at once loved her, and desired to make her his own. As she reciprocated his passion, he visited her every night, earnestly requesting her not to inquire or seek to know who he was. But her jealous sisters, working upon her fears and her curiosity as well, represented to her that she was embracing a monster in the darkness of the night, and to satisfy herself she lighted a lamp while Cupid was asleep, when to her great delight she saw that her lover was the handsomest of gods. In her excitement, however, she let a drop of hot oil fall on his shoulder, when he arose, and after upbraiding her for her doubts, left her alone. After wandering about for some time, she came to the palace of Venus, when she was seized by the goddess, and kept as a slave. Cupid, however, still loved her, and after a time was united to her in immortal wedlock. The story of Psyche is considered by all critics as a beautiful representation of the progress of the human soul through earthly passion and misfortune to eternal peace and happiness.

Psychology (*sī-kol'ō-jy*) (Greek *pyschos*, "soul," and *logos*, "discourse"), the science of mind, or, in more general terms, the science of man's immaterial nature. The dividing line between mind and matter cannot be definitely drawn, because neither of them can be accurately defined; but our reason plainly teaches us that there is a fundamental difference between them, notwithstanding the intimate relation they sustain to each other. To escape the difficulty of properly distinguishing between mind and matter, one school of extremists, whose chief apostle was the famous Bishop Berkeley, maintains that mind is the only reality in the universe, and that all external or visible objects are, at most, but expressions or manifestations of mental states. Another school, much more numerous than the former, regard all mental acts, and states, as mere qualities of matter, or, at most, as mere results of the *force* with which matter has been endowed. Thought, feeling, volition, this school tells us, are the product or output of man's brain and physical organization, as a flame of heat is the output of a fire, or as rays of light are the output of the sun, under all the physical conditions to which it is subject. It ought to be a sufficient answer to both these schools, that we are conscious of living in both a material realm and in one that is not material; we know that there is an external world, and we also know — to use the language of Scripture — that "there is a spirit in man"; we know that we have bodies made of flesh and bone and blood, and we also know that we have a *being* that is not flesh, or bone, or blood; we know that we have "senses, affections, passions," and we know, too, that we have qualities within us that unite us to the unseen and the eternal.

The division of the mental faculties which is now generally accepted is threefold, (1) the intellect, (2) the sensibilities or emotions, (3) the will. Under each of these there are numerous subdivisions. Of late years, the science of psychology or mental philosophy has received a large measure of attention; not only in schools and colleges, but from the general public; and we can only refer the reader to the various essays and textbooks — their name is legion — that have been written and published on the subject. See *Elementary Psychology*, by Sorley, and Höffding's *Outlines of Psychology*.

Pteridophytes (*ter'i-dō-fits*), one of the four great groups of plants, which includes the ferns, the scouring rushes or horsetails, and club mosses. The ferns are the most abundant and representative forms, containing about 4,000 species; the club mosses are represented by a little over 400 species; while the horsetails are represented by only 25 living species. The group as a whole is characterized by having a leafy and vascular sporophyte, in this way decidedly differing from the bryophytes (mosses) and resembling the spermatophytes (seed plants). From the seed plants it differs in that its members do not produce seeds. The group as a whole is most extensively developed in the tropics, where especially the ferns and "little club mosses" (*Selaginella*) are luxuriant both in forms and numbers. The three great divisions of pteridophytes differ exceedingly from one another in external appearance, but they are all held together by important similarities. One of their important characteristics in common is the possession of a large coiled and multiciliate sperm, very distinct from the simple biciliate sperm of the bryophytes. See EQUISETALES, FILICALES, and LYCOPODIALES.

Ptolemy (*tŏl'e-mĭ*), **Clau'dius Ptolemæ'us**, an eminent mathematician and astronomer. He was born probably either in the year 70 or 77 A. D., and died at Alexandria in 147 A. D. As a mathematician he is especially to be remembered as having written the first treatise on trigonometry, a branch of mathematics invented by Hipparchus.

In astronomy he wrote a complete treatment upon the entire subject as it was known in his time. This volume, called the *Almagest*, remained a standard work until the time of Copernicus. Ptolemy here assumes that the earth is spherical, that it is placed in the center of the spherical heavens, and that it is

a mere point compared with the distances of the fixed stars.

As a geographer Ptolemy was the first to point out the fact that the position of any point on the earth's surface can be accurately stated only after its longitude and latitude have been determined. In addition to his works he wrote a volume on optics, in which he stated the correct laws of reflection for plane surfaces and for concave mirrors, as well as the law of refraction. Ptolemy must be considered as one of the earliest types of the modern scientific investigator.

Pub'lic Schools. See SCHOOLS.

Puck or **Rob'in Good'fellow,** a familiar figure in the fairy world of English folklore, immortalized by Shakespeare in *Midsummer Night's Dream.* The name is really a generic term for a fairy. Although the Pucks are noted for mischievous tricks, they sometimes perform kindly domestic functions; are small and dwarf-like in appearance. and are easily propitiated by offerings of cream and kindly epithets. The name *Puck* was adopted by an illustrated weekly published in New York.

Puebla (*pwĕb'lä*), the second city of Mexico, stands on a fruitful plain, 7,000 feet above the level of the sea and about 100 miles by rail from the City of Mexico. It was founded in 1531, and is one of the handsomest cities in Mexico. During the French occupation of Mexico, in 1862–63, it was besieged by Maximilian's troops for two months, and then taken by storm May 17, 1863. Population 88,684. Puebla is also one of the inland states of Mexico, area 12,204 square miles, with a population of 973, 876.

Pueblo (*pwĕb'lō*), a city of Colorado on the Arkansas river, a little over 100 miles from Denver. Through its iron and steel industry it has become the second city in the state and an important railway center. In 1890, a mineral palace was here erected to hold a permanent exhibit of Colorado's mineral productions — gold, silver, coal, etc., — at a cost of nearly $1,000,000. Population 28,157.

Pueblos (*pwĕb'lōs*) (Spanish *pueblo*, "village"), a semi-civilized family of Indians living in New Mexico and Arizona, dwelling in single habitations, which are sometimes large enough to contain a whole tribe. These buildings, which are sometimes five or six stories high, and from 100 to 500 yards in length, are generally made of sun-dried brick; the ground floor is always without doors or windows, entrance being effected by a ladder leading to the second story. Each family of the tribe has a separate apartment, and there are also large rooms for general council chambers and for tribal dances. Under Roman Catholic missionaries, the Pueblos are making steady progress in education and civilization, although they have grafted upon their Christianity many of their old pagan beliefs and customs, to which they still cling. The Cliff-dwellers were doubtless the ancestors of the Pueblos, ruins of whose dwellings are seen in the cañons of the Rio Mancos, the Rio Plata, and the San Juan rivers in southwest Colorado, New Mexico, and Arizona. In these cliffs the strata of sand stone or lime stone were separated by layers of soft clay which had worn away, leaving ledges of rock with caverns between. Upon these terraces are remains of clusters of dwellings, one ledge forming the floor and another the roof, the opening being faced so skillfully as to resemble the rock of the cliff. Some of these dwellings are now inaccessible. The marks of dangerous doubling paths, hardly a foot wide, formerly used, can be seen on the cañon walls. The San Juan cañon is shut in by walls of rock several thousand feet high, and one settlement is 1,000 feet above the Rio Mancos. Cliff villages or towns are found in the bottom lands, with round stone towers near them, evidently used as watch towers.

Puer'to Rico. See PORTO RICO.

Puff'balls, fleshy fungi related to the mushrooms, but in which the spores fully develop without being exposed. See BASIDIOMYCETES.

Puget (*pū'jet*) **Sound,** a large inland sea northwest of the state of Washington, communicating with the Pacific ocean by the Admiralty inlet and the strait of Juan de Fuca. It penetrates far into the interior, and is everywhere navigable for the largest vessels, which, in most cases, can ride close to the shores and load and unload without wharves. Great quantities of pine and fir are shipped from the region, which is rich in timber. Seattle and Tacoma are the chief towns on the sound.

Pulas'ki, Cas'imir, a Polish count and general, who fell in the American Revolutionary war, was born in Podolia, March 4, 1748. On account of the active part he took in the Polish war against Russia, he was stripped of his estates and outlawed in the partition of Poland in 1772. In 1777, he offered his services to the American colonies in their contest against England, and for his gallant conduct at the battle of Brandywine was given a brigade of cavalry, which he commanded until March, 1778. In May, 1779, he entered Charleston at the head of "Pulaski's legion," a corps of lancers and light infantry which he had organized, and held it until the place was relieved; he afterward followed and harassed the British until they left South Carolina. At the siege of Savannah, on the 9th of October, he fell in an assault at the head of the cavalry, and died on board the brig *Wasp* two days later.

Pull'ey, one of the mechanical powers much used in lifting stone and heavy timber. It consists of a wheel with a grove around its

circumference, which revolves on an axis. The wheel, which is commonly called the *sheave*, is placed in a mortised block of wood, which is pierced by the axle of the sheave. The cord which passes over the sheave is

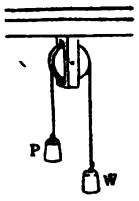


FIG. 1.

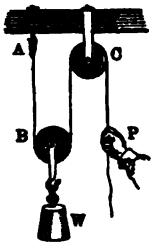


FIG. 2.

called the *tackle*. The *fixed pulley* (Fig. 1) gives no mechanical advantage; it merely changes the direction in which the force is applied; thus W can be raised by merely pulling P down. The *single movable pulley* gives a mechanical advantage, equal to two

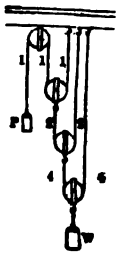


FIG. 3.

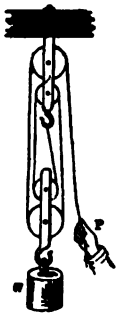


FIG. 4.

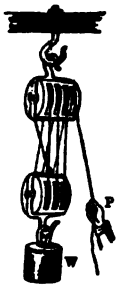


FIG. 5.

(Fig. 2); for as the weight W is supported by two strings, the strain on each string is just half of W; since the strain on one being supported by the hook A, the power P has to support only the stress of the other string which passes around C. A still greater mechanical advantage is secured by a combination of pulleys, as shown in the second illustration. Theoretically, the larger the number of movable pulleys in any one combination, the greater is the mechanical advantage; but the enormous friction produced and the lack of perfect flexibility in ropes prevent any great increase in the number of pulleys. See BLOCK AND TACKLE.

Pull'man, George M., an American inventor and business man, was born at Brocton, Chautauqua county, N. Y., March 3, 1831. At the age of twenty-two he engaged in moving buildings out of the way of the Erie canal, then in process of widening. He made his home in Chicago in 1859, and in the same year he prepared models of sleeping cars, which became the foundation of his fortune. He made a success of raising buildings to the new level of the city by means of a great many jack-shrews, operated simultaneously. But in 1863 he began building the coaches that are called by his name the world over. A few years later, he organized the Pullman Palace Car company which was to build them. In 1880, he founded the town of Pullman, near Chicago, where the coaches were built. In 1887, he added the vestibule to his cars, which greatly increased their comfort. These car shops turn out $15,000,000 worth of railway carriages annually. He died in 1897, (Oct. 19), having amassed a large fortune from his inventions and his various business enterprises.

Pulque (*pul'ka*), a favorite beverage of the Mexicans and of the inhabitants of Central America and some parts of South America, made from the fermented juice of the agave plants.

Pulsatilla (*pŭl'sȧ-tĭl'la*) or **Pasque Flower**, is a native of many parts of Europe and of chalky pastures in several parts of England. It has bell-shaped, bluish-purple flowers. It is narcotic, acrid, and poisonous. Pulsatilla is one of the favorite medicines of the homœopathists; and Easter eggs are sometimes colored purple with the petals of the flower.

Pulse (Latin *pulsus*, "a pushing or beating"). The phenomenon known as pulsation is due to the distension of the arteries when blood is sent through them by the contraction of the heart. The pulse is usually examined at the radial artery at the wrist, the advantage of that position being that the artery is easily compressed against the bone. The frequency of the pulse varies with age, from 130 to 140 beats per minute in infancy, to 70 to 75 in adult age. It also varies somewhat with sex, adult females having six or eight more beats per minute than males. It is increased by exertion or excitement, and is diminished by lying down or sleeping. In some diseases, the pulse may reach 150 to 200 beats per minute; and, on the other hand, in certain organic affections of the heart it may be as slow as 25 or 30. The force of the beats is a measure of the vigor and efficiency of the heart's action, a strong pulse being regarded as a sign of health and vigor, and a weak pulse as a sign of debility. The full significance of any changes of pulse in disease can be clearly understood only by considering them in connection with other signs and symptoms in the case.

Puma (*pū'mȧ*), a member of the cat family, inhabiting the Americas from Canada to Patagonia. It goes under a variety of names in different parts of the country, as catamount, panther, American lion, etc. It is about 40 inches long, without the tail, tawny in color above, and soiled white below. They are good climbers, but are not confined to wooded districts. They prey upon deer, antelope, and other animals, near habitations; they kill

calves, pigs, and sheep. See True's *The Puma or American Lion*, Report United States National Museum (1889).

Pumice (*pŭm'ĭs*), a light mineral, full of pores like a sponge, found near volcanoes. This highly porous and froth-like structure is due to the escape of vapors through the lava while it was in a state of fusion. It is much used for polishing wood, ivory, metals, glass, marble, etc. Great quantities are exported from the Lipari islands to all parts of Europe.

Pump, a machine for lifting water or other liquids to higher levels. The simplest form of a pump is the common suction pump, which is shown in Figure 1. A is the barrel; B is a pipe reaching down into the water which is to be raised; C is the spout; D is a fixed valve opening upward only; E is a movable valve opening upward only, and this is carried in the bucket F, which is a hollow piece of wood or metal which, by leather or other packing, is made to fit in the barrel so closely that the water cannot pass between the bucket and the barrel; G is the piston rod which is operated by hand, by steam, wind, or other power, and moves the bucket up and down in the barrel. The up stroke of the piston at first lifts air, and as the air cannot return past the air-tight bucket, a partial vacuum is produced in B. The external pressure of the atmosphere causes the water to ascend in B. By repeated strokes of the piston, the air below E becomes exhausted and the water continues to ascend until the valve D is under water; thereafter the strokes of the pump lift the water above D and force it into the spout C.

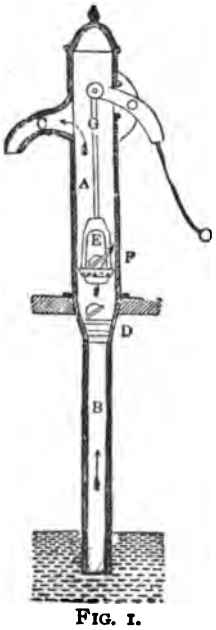


FIG. 1.

The force pump shown in Figure 2 is used to force water up into buildings. The piston is solid and the valve E, instead of being carried by the piston, is fitted in the discharge pipe. When the piston is raised up, the water rushes in between the piston and the valve below and with the downward motion of the piston the water is forced past the valve E; it cannot return, and by repeated strokes the water may be forced to a considerable height. Force pumps are used for deep wells and mines, hydraulic presses, steam and fire engines, etc. There are other and more complicated forms of pumps, but all depend on the principles here explained. See article AIR PUMP.

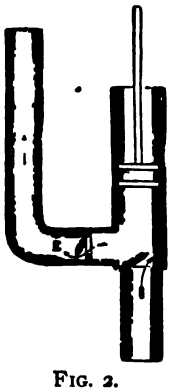


FIG. 2.

Punch, or the *London Charivari*, an English comic journal, is a weekly magazine of wit, humor, and satire, in prose and verse, copiously illustrated by sketches and caricatures. It draws its materials from the highest and lowest conditions of life, and while stern in the exposure of sham and vice, is yet kindly in spirit when making merry over innocent foibles. The first number of *Punch* appeared in 1841, and under the joint editorship of Henry Mayhew and Mark Lemon it soon became a household word as well as an acknowledged power throughout England. It has done much to purify and elevate the standard of current wit in England. Mr. F. C. Burnand is its present editor.

Punch and Judy, the chief characters in a popular comic puppet show of Italian origin. It is generally ascribed to Silvio Tiorillo, an Italian comedian, who flourished about 1600. The performance of the play requires only two persons, one to carry the theatre and work the figures, the other to bear the box of puppets, blow the trumpet, and sometimes keep up the dialogue with the hero of the piece.

Punctua'tion may be defined as the art of dividing sentences or clauses with certain marks, so as to make the sense more complete. Manutius, a Venetian printer of the 16th century, is generally regarded as the father of our present system of punctuation. Its principal marks are the period (.) generally placed at the end of a sentence, and the end of abbreviated words; the comma (,) used to separate words or pairs of words, and sometimes clauses; the semicolon (;) used to separate clauses or divisions of a sentence requiring a more marked separation than is indicated by the comma; the colon (:) used where the sentences require a more marked separation than is indicated by the semicolon; the dash (—) sometimes performing the offices of the comma, the semicolon, or the colon, but generally used to indicate a break in the thought or a change in the structure of a sentence; the interrogation point (?) used to denote a question; the exclamation point (!) used to express surprise or any special emotion; the hyphen (-) used between the divisions of a compound word and to divide any word at the end of a line; the apostrophe (') used as a sign of the possessive case and to supply the place of any letter or letters omitted from a word; the parentheses or curves ( ) used to inclose any word or words essential to the meaning of the passage; the brack-

ets [ ] used to include the words or remarks of the author within the writing of some other person; the quotation marks, consisting of two inverted commas and two apostrophes (" "), used to inclose any word or words quoted from another person; the ellipsis (* * * * *), or dots (. . . .), used to denote the omission of words from a quotation; the index (☞) used to point out any particular sentence or statement; the star or asterisk (*), the dagger (†), the double dagger (‡), the section (§), the parallel (‖), the paragraph (¶), which refer to notes at the bottom of the column or page, or at the end of the article or chapter. There are numerous rules for the use of these various points, but perhaps no two writers or printers would agree as to the proper point to be used in all cases. Good judgment and taste and a certain amount of practice are essential to anyone who would punctuate in such a manner as to secure the fundamental object of punctuation — the expression of the sense.

To illustrate the aid that punctuation will sometimes render to an understanding of the sense of any composition, take the following example: —

Every lady in the land
Has twenty nails on each hand
Five and twenty on hands and feet
This is true without deceit.

Now read the same properly punctuated: —

Every lady in the land
Has twenty nails; on each hand
Five, and twenty on hands and feet;
This is true without deceit.

To show how punctuation may sometimes vary the sense of any speaker or writer, the following example will serve: A member of the English house of commons called one of his fellow members a liar and was compelled publicly to apologize for the offense. He did so by rising in his place and meekly saying: "I said he was a liar, it is true; and I am sorry for it." The apology was deemed sufficient; but in the newspaper which published an account of the matter the next day, the apology was printed thus: "I said he was a liar; it is true, and I am sorry for it."

Pu'nic Wars. This is the name commonly given to those contests which occurred between Rome and Carthage for the supremacy of the western world. The Romans called the Carthaginians Punici, in allusion to their Phœnician descent. The Romans never trusted their foes in the matter of their treaties, and so came to speak of "Punic faith" as synonymous with treachery. The various wars waged between Rome and Carthage will be found under the name of these cities, or told in the biographies of the commanders of the forces engaged. The first Punic war broke out in 264 B. C., the third in 149 B. C.

Punjab (*pun-jäb'*) or **Panjab,** a province of India, occupying the northwest corner, is watered by the Indus and its five great affluents — the Jhelum, Chenab, Ravi, Beas, and Sutley. The area under direct British administration (it was annexed by that power in 1849) is 110,667 square miles; that of the native states under British control, 22,509 square miles, with a population of 4,232,074. Population in the entire province 22,000,000. The whole of the northern part is traversed by spurs from the Himalayas which inclose deep valleys; but in the south the surface is not broken by any elevations, except the Salt range, varying from 2,000 to 5,000 feet in height. More than half the population are Mohammedans. The Punjab is the country of the Sikhs.

Pu'ritans, the name first given — according to Fuller, in 1564, and according to Strype, in 1569 — to those clergymen of the church of England who refused to conform to its liturgy and discipline as arranged by Archbishop Parker and his coadjutors. During the reigns of James I. and Charles I., the spirit of Puritanism continued to spread in English society and in parliament, in spite of all efforts made by the government to suppress it, the tyranny of Laud and the outrages of Charles on the English constitution leading many who were not strictly Puritans to oppose both church and king, for the sake of their national liberties. Before the war between Charles and the parliament broke out, a considerable number of the Puritans emigrated to America, where they became the founders of the New England states, and practiced the form of religion to which they were attached. For an eloquent description of the character and virtues of the Puritans, see Macaulay's *Essay on Milton.*

Pusey (*pū'zi*), **Edward Bou'verie,** a distinguished divine of the English church, was born at Pusey, in Berkshire, in 1800, and graduated with high honors at Oxford, in 1822. In the year 1827, he was appointed professor of Hebrew at Oxford, a position he held until his death. In connection with Keble and Newman, Pusey took a very active part in the "Tractarian movement"; and, in 1843, was suspended from preaching for three years on account of a sermon on the Holy Eucharist. But he did not follow Newman into the Roman Catholic church, preferring to remain in the Anglican communion, and exerting all his talents and learning to sustain the evangelical doctrines and standards of life that were so dear to him; and in spite of all difficulties in his way he continued his labors to this end until the close of his life. In private life, Pusey was a man of warm affection, and was widely known for his gentleness, sincerity, and humility. His charity was limited only by his income; besides abundant gifts to the poor, he spent large sums in helping to provide churches in East London, and in founding and supporting sisterhoods. He died at Oxford, Sept. 16, 1882. See *Life*, by Canon Liddon.

Put'nam, Israel, a general of the American Revolution, was born in what is now Danvers, Mass., Jan. 7, 1718. In the year 1739, he bought a farm near Pomfret, Conn., and devoted himself to its cultivation and to wool-growing. During the years he was engaged in this occupation, a she-wolf committed considerable ravages upon his sheep and those of the neighborhood, and all efforts to capture or kill her were in vain, until Putnam entered her den in a rocky cavern with a torch in one hand and a gun in the other, and shot her before she had time to spring upon him. Putnam distinguished himself in the French and Indian war, and at the breaking out of the Revolutionary war was placed at the head of the Connecticut troops. He was very active and conspicuous at the battle of Bunker Hill, soon after which he was commissioned major-general in the Continental army, and in 1777 was appointed to the defense of the Hudson river highlands. While at Peekskill, a lieutenant in a British regiment was captured as a spy and condemned to death; and when Sir Henry Clinton sent a message under a flag of truce, threatening reprisals if the sentence should be carried out, Putnam returned the following famous answer: "Headquarters, Aug. 7, 1777. Edmund Palmer, an officer in the enemy's service, was taken as a spy lurking within our lines; he has been tried as a spy, condemned as a spy, and shall be hung as a spy, and the flag is ordered to depart immediately — Israel Putnam. P. S. He has accordingly been hung." In 1778, Putnam made his famous escape from Tryon's dragoons by riding down a steep declivity at Horseneck, Conn. The next year he suffered a stroke of paralysis, and the remainder of his life was spent at home. He died at Brooklyn, Conn., May 19, 1790.

Put'nam, Rufus, cousin of Israel Putnam, was born at Sutton, Mass., April 9, 1738, and served against the French from 1757 to 1760. In 1778, he helped his cousin to fortify West Point, and had command of a regiment afterward until the close of the war, being made brigadier-general in 1783. He helped to found Marietta, O., in 1788, was made a judge of the supreme court of the Northwest territory in 1789, and was surveyor-general of the United States from 1793 to 1803. He died at Marietta, O., May 4, 1824.

. **Putrefac'tion** is the term applied to the decomposition of organic substances when accompanied by an offensive smell. It is now known to be the result of the activity of certain minute plants, called bacteria, which also cause fermentation and many diseases. The spores of these plants are present in great numbers in the air and water, and on the surface of the earth; but if we boil an infusion of organic matter, and while the steam is coming freely off, close it up in such a manner as to prevent any germs or spores from reaching the fluid, it will remain without any change for many years, but will begin to putrefy in a day or two if the plug be removed. Of the precise chemical changes that take place from the life of bacteria, we are still largely ignorant.

Pygma'lion, in Greek mythology, grandson of Agenor, king of Cyprus, fell in love with an ivory statue of a young maiden he himself had made, and prayed to Aphrodite to give it life. His prayer being granted, he married the maiden, who bore him Paphus.

Pym, John, was born at Brymore, near Bridgewater, England, in 1584. He entered Oxford university in 1599, but left in 1602 without taking a degree, and then studied law at one of the inns of the court. Entering parliament in 1621, he at once attached himself to the country party, and proceeded to war against monopolies, papistry, and absolutism with a force and vigor that brought him three months imprisonment. In the "Short Parliament" of 1640, "when" — to use Clarendon's words — "men gazed on each other, looking who should begin, Pym broke the ice by a two hours discourse, in which he summed up shortly and sharply all that most reflected upon the prudence and justice of the government, that they might see how much work they had to do to satisfy their country." In the impeachment of Strafford, and in all other proceedings of the "Long Parliament" which assembled in 1641, Pym took a leading part, his power and ability being acknowledged by the Royalists in the derisive epithet of "King Pym." He was one of the "five members" whom Charles I. attempted to arrest in the chamber of the house of commons, thus precipitating the civil war, which resulted in the defeat and execution of the king. Soon after hostilities began, Pym was appointed lieutenant of ordnance; but died at London, Dec. 8, 1643. He was buried in Westminster abbey, but at the restoration of Charles II. his remains were cast into a pit in St. Margaret's churchyard. See Goldwin Smith's *Three English Statesmen.*

Pyr'amids, structures erected in different parts of the east, the most important being the pyramids of Egypt, which were reckoned by the ancients as one of the seven wonders of the world. They are about seventy-five in number, of different sizes, and are masses of stone (or rarely brick) with square bases and triangular sides. Various opinions have prevailed as to the purpose for which they were built; but in all probability they were simply tombs or monuments of the Egyptian monarchs who flourished from the first to the twelfth dynasty. The Egyptian monarch was ever careful in the preparation of his "eternal abode." The most remarkable pyramids are those of Gizeh, situated on the edge of the Libyan desert, near Memphis, on the west bank of the Nile. Of the three largest and most famous, the First or Great Pyramid was the sepulchre of Cheops, the second king of

the 4th dynasty. Its height was originally 481 feet, and its base 774 feet square, covering about 13 acres of ground; but it has been much despoiled and stripped of its exterior blocks for building the mosques and walls of Cairo. The original sepulchre chamber, 46 x 27 feet and 10 feet 6 inches in height, was hewn in the solid rock, and was reached by a passage, 320 feet long, which descended to it from the entrance at the foot of the pyramid. According to Herodotus, 100,000 men were employed on this pyramid for thirty years. The second pyramid was built by Chafra or Chephren, third king of the 4th dynasty. It is 450 feet in height, on a base of 700 feet square (over 10 acres) and has two sepulchral chambers, which were opened by Belzoni in 1816. The masonry is inferior to that of the first pyramid; but it was anciently cased below with polished stones, only a portion of which remain, while the top still retains its original casing. The Third Pyramid, built by Menkaura or Mycerinus, fourth king of the 4th dynasty, is much smaller than the other two, being only 215 feet in height, by 350 feet square at the base. The masonry of this pyramid is most excellent; and it was anciently cased half-way up with granite, the remains of which are still visible. The third pyramid is regarded with superstitious dread by the natives, on account of a supposed woman's ghost, and there is a legend connecting it with the courtesan Rhodope.

There are six other pyramids in Gîzeh; others at Abou Roâsh, six miles to the northwest. In Nubia, the ancient Ethiopia, are several pyramids, the tombs of the monarchs of Meroë from 600 to 100 B. C., and of some of the Ethiopian conquerors of Egypt. They are higher in proportion to their base than the Egyptian pyramids, and generally have a sepulchral hall or propylon, with sculptures, which faces the east. Cleopatra's Needles were obelisks built for sepulchral use and are described under the topic OBELISK. See *The Great Pyramid* by R. A. Proctor; *Our Inheritance in the Great Pyramid*, by C. Piazzi Smith; and *A Miracle in Stone*, by Joseph Seiss, D.D.

Pyr'amus and This'be, two lovers whose tragical history is told by Ovid in the 4th book of his *Metamorphoses*. They were natives of Babylon, and tenderly attached to each other; but as their parents would not consent to their marriage, they had to content themselves with secret interviews by night. On one occasion they arranged to meet at the tomb of Ninus, where Thisbe, who was first at the trysting spot, was startled to discover a lion. She immediately ran away, but dropped her robe, which the fierce animal that had just torn an ox in pieces, covered with blood. Soon after Pyramus appeared, and seeing Thisbe's robe, concluded she had been murdered and killed himself. When Thisbe returned soon after, and saw her lover lying dead on the ground, she immediately put an end to her own life.

Pyr'enees, the mountain chain that divides France from Spain. It stretches across from the Mediterranean to the southeast corner of the bay of Biscay, a distance of 270 miles, the breadth of the system varying from 15 to 70 miles. The chain is divisible into three distinct portions — the western, the central, and the eastern. On both north and south the mountains sink down to the plains in a series of terraces with precipitous faces, the general slope on the Spanish side being somewhat steeper than that on the French side. See *Voyage aux Pyrénées*, by Taine.

Pyrenoids (*pi-rē'noidz*) (in plants). In the chloroplasts of certain algæ, as in Spirogyra, there are usually seen embedded one or more colorless bodies, each one often surrounded by a jacket of starch. These bodies are reserve proteid and are known as pyrenoids.

Pyrites (*py-rī'tēz*), a name employed by mineralogists to designate a number of minerals which are compounds of metals with sulphur, or arsenic, or both. They are hard, brittle, have a metallic appearance, and are frequently yellow. The kinds most usually mentioned are iron, copper, and arsenical. Iron pyrites is sometimes mistaken for gold, on account of its yellow color, and is therefore called "fool's gold." It is much used in the manufacture of sulphuric acid, and sulphur is obtained from it by sublimation. It is also used for the manufacture of alum. Copper pyrites is the most abundant of all the ores of copper, and yields a large proportion of the copper used in the world. Arsenical pyrites or mispickel is of a silver-white color, and is the most common natural compound of arsenic. It is sometimes valuable on account of containing cobalt. In addition to these three kinds of pyrites are pyrrhotite or magnetic pyrites, which sometimes contains nickel, and marcasite or white iron pyrites. Both of these consist chiefly of iron and sulphur.

Pyrometer (*pī-rŏm'ē-tẽr*), a term in engineering, used to describe an instrument for measuring temperatures so high or so low that mercurial thermometers cannot be used. All the older forms of this apparatus, depending upon the expansion of solids with rise of temperature, have entirely gone out of use.

Modern pyrometers are practically all dependent upon either one or the other of two electrical principles. The first of these types is based upon the discovery of Seebeck, that when an electric circuit is made up of two different metals a current will flow in that circuit which is proportional to the difference in temperature between the two junctions. By placing a galvanometer in the circuit this current may be measured. And after the circuit has once been calibrated we may infer the temperature of one junction by knowing

the current and the temperature of the other junction. This form of pyrometer has been perfected principally by Le Chatelier, a Frenchman.

The second type of pyrometer depends upon the fact that the electrical resistance of a platinum wire varies with its temperature. Having selected a definite piece of pure platinum wire and having measured its resistance at various standard and known temperatures, we have only to place this platinum wire in the region whose temperature is desired and measure its resistance. The temperature of the region is then given by interpolation. This form of pyrometer has been perfected especially through the efforts of the English physicist, H. L. Callendar. It is frequently called a "platinum thermometer."

Pyrotech'ny. See FIRE'WORKS.

Pyrrhus (*pĭr-us*), king of Epirus, was born about 318 B. C. He became sole king of Epirus in 295 B. C., and in the following year increased his territories by the addition of the western parts of Macedonia. In the year 280 B. C., he engaged in a war against the Romans, the first battle taking place on the banks of the river Siris, in Lucania. After an obstinate and bloody contest, Pyrrhus won the day by bringing forward his elephants, and thereby exciting the terror of the Romans. Pyrrhus' loss of soldiers was so great that after the fight he is said to have exclaimed: "Another such victory, and I must return to Epirus alone." Hence the phrase, "Pyrrhic victory." After continuing the war another year without any substantial results, a truce was made between the belligerents, and Pyrrhus withdrew to Tarentum. In a second war with Rome, a few years afterward, he was utterly defeated by the Consul Curius Dentatus near Beneventum, escaping to Epirus with only a few followers; but in less than a year after this he was induced to enter on a war with the Spartans. He marched a large force into the Peloponnesus, and tried to take their city, but was repulsed in all his efforts. He then proceeded against Argos, in Greece, where he was killed in 272 B. C. by a tile hurled at him by a woman from the roof of a house.

Pythagoras (*pi-thag'ō-ras*), a Greek philosopher, and founder of a school of philosophy, was born on the island of Samos about 582 B. C.; but his history has been so obscured by a mass of legend that it is difficult to arrive at anything certain in reference to his life. He is said to have been a disciple of Thales and other distinguished philosophers, and to have undertaken extensive travels for the purpose of acquiring knowledge. In the course of these travels, which continued nearly thirty years, we are told that he visited Egypt and the more important countries of Asia. We have reason to believe that he visited Egypt at least, and that he learned from the priests of that country the doctrine of the transmigration of souls, which is one of the famous tenets of his school. He is even said to have asserted that he had a distinct recollection of having himself passed through other stages of existence. On seeing a dog beaten and hearing him howl, he bade the striker to desist, saying, "It is the soul of a friend of mine, whom I recognized by his voice." Pythagoras is said to have been the first to assume the title of *philosopher* (which means "lover of wisdom") in place of the name *sophos* (which means "a wise man"). We have reason for believing that he was a man of much learning, especially in mathematics. His school taught that in number alone is certainty to be found; that number is the essence of all things; that in some mysterious way numbers are things themselves. The moral teaching of the Pythagoreans was of the purest and most spiritual kind; virtue was regarded as a harmony of the soul; self-restraint, sincerity, and purity of heart were especially commended, and conscientiousness and uprightness would seem to have been their chief characteristics. Of the fate of Pythagoras different accounts are given, but he is generally supposed to have died at Metapontum, Magna Græcia, 500 B. C., where his tomb was to be seen in the time of Cicero.

Pyth'ian Games, one of the four great national festivals of the Greeks, are said to have been instituted by Apollo after vanquishing the snaky monster Python. They were at first under the management of the Delphians; but about 590 B. C., the Amphictyons were intrusted with the conduct of them, after which they were held every four years at Adelphi, in honor of Apollo. Some writers claim that they were not called Pythian till after this date. Originally, the contests were restricted to singing and cithern playing; but the Amphictyons added the flute, athletic contests, and horse racing. By and by, contests in tragedy and other kinds of poetry, in historical recitations, and in works of art, were introduced and long continued a distinguishing feature of these games, which are believed to have lasted for three or four centuries after Christ. The prize was a laurel wreath and the symbolic palm branch.

Python (*pī'thŏn*). See BOA.

Pyxis (*piks'is*), a peculiar pod which opens at its apex by a circular lid, as the common twinleaf (*Jeffersonia*).

Q

Quadrant (*kwŏd'rant*), an astronomical instrument, invented by Hadley in 1731, for use in measuring angles at sea and in other places where a fixed divided circle is not available.

The quadrant, in a crude form, had been used for several hundred years before the time of Hadley, if we admit the astrolabe graduated through 90° as a species of quadrant. But Hadley so improved the instrument by introducing a fixed and a movable mirror, and by bringing into the same line the images of the two objects whose angular distance is to be measured, that he really made a new and highly valuable piece of apparatus out of it. The quadrant is merely a brass frame, provided with a radial arm carrying a mirror, whose polished surface contains the axis of the quadrant. By looking through the small telescope and a half-silvered mirror (attached to the quadrant) at any particular object, one may, by rotating this radial arm, make the image of a second object appear in the same direction as the first. The angle through which the arm must be turned to secure this coincidence is half the angle subtended by the two objects; and this angle is read directly from the graduated edge of the quadrant. Sometimes only 60° of the edge is graduated, in which case the instrument is called a *sextant*.

Hadley's invention immediately displaced the astrolabe and the cross-staff which had hitherto been used for taking latitudes at sea. A considerable part of the accuracy of the quadrant is due to the use of the vernier, which was invented by Pierre Vernier in 1631. About the same time, the telescopic sight was invented by Gascoigne and the tangent screw by Helvelius. These all combine to make the quadrant or sextant a thoroughly accurate instrument, and one which is now in daily use by all navigators.

Quadrilat'eral, the name given in history to the four fortresses of northern Italy — Mantua, Verona, Peschiera, and Legnago — which form a sort of outwork to the bastion of the mountains of the Tyrol, and divide the north plain of the Po into two sections by a powerful barrier. They have figured in all the later wars that have been fought in northern Italy, especially in the wars between Austria and the different Italian states. Russia has a similar combination of four fortresses in Poland, called the Polish Quadrilateral.

Quad'ruple Alli'ance, a league against Spain, formed August, 1718, between Britain France, Austria, and Holland, to counteract the ambitious schemes of Alberoni. It was made upon the basis of the Triple Alliance, which was formed in January, 1717, between England, Holland, and France, and by which the clauses in the treaty of Utrecht having reference to the accession of the house of Hanover in England, the renunciation by the Spanish king of his claims to the French throne, and the accession of the house of Orleans to the French throne, should the young king, Louis XV., die without issue, were guaranteed. The Spanish fleet was destroyed by Byng off Cape Passaro, while the French crossed the Pyrenees and defeated the Spaniards several times; at length, Philip was compelled to dismiss his ambitious minister, Alberoni, and accept the terms of the Quadruple Alliance.

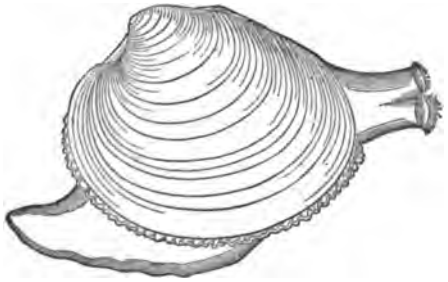
Quæstor (*kwĕs'tor*), was anciently the title of a class of Roman magistrates, reaching as far back, according to all accounts, as the period of the kings. The oldest quæstors were the *quæstores parricidii* ("investigators of murder," finally public accusers), who were two in number. Their office was to conduct the trial of persons accused of murder, and to execute the sentence that might be pronounced. They ceased to exist as early as 366 B. C., when their duties were transferred to the *Triumviri Capitales*. But a far more important, though later office, was the *quæstores classici*, to whom was intrusted the charge of the public treasury. They seem to have gained the name of classici from their having been elected originally by the centuries. At first they were only two in number, but in 421 B. C. two more were added. Shortly after the breaking out of the First Punic war the number was increased to eight; and as province after province was added to the Roman republic, they amounted in the time of Sulla to twenty, and in the time of Cæsar to forty. At first, only patricians could be quæstors; but after 421 B. C. the office was open to plebeians also.

Quagga (*kwăg'ga*), a striped wild ass, related to the zebra, and, like the latter, peculiar to Africa. It was formerly abundant, in

QUAGGA.

herds, on the plains south of the Vaal river, but is now rare, if not extinct. During the period of its abundance, thousands were killed annually by Boer hunters, for their skins. It is easily distinguished from the three other members of the family, although Burchell's zebra is often erroneously called quagga. The head, neck, mane, and shoulders are striped, but the stripes fade out behind the shoulders, and the hind quarters and legs are unstriped. It is of stouter build than the zebra, but has ears and tail more like a horse. Its color is reddish brown above with dark brown spots, the under surface and the legs being nearly white.

Quahaug (*qwa'hŏg*), the common round clam of the Atlantic coast found from Texas



CLAM.

to Cape Cod. It is frequently seen in the eastern markets and is much esteemed as food.

Quail, a small game bird of the Old World, belonging to the partridge family. There are six species. The common European quail is about seven inches long, with a very short tail. They are of a brown color, streaked with buff. They are ground birds. They winter in Africa, and are trapped in large numbers for the market. The birds called quail in the United States belong to a different family. The bob-white is a good type. They nest on the ground, laying from ten to eighteen white eggs, but sometimes they perch on trees. They remain throughout the year, and should be protected and fed, for they are helpful to the farmer in destroying many injurious insects. They are especially fond of the Colorado potato beetle.

COMMON QUAIL.

Quakers or **Society of Friends,** a sect founded by George Fox in 1648–66. In spite of severe and cruel persecutions, the Quakers succeeded in establishing themselves both in England and in America. Although not a large denomination, they have exerted a strong and good influence on the public at large, by their purity of life and the stand they have taken in certain great questions, such as war and slavery. As early as 1727, they commenced to censure the traffic in slaves, and opposed it more and more warmly, until the whole British nation felt the glow and set their slaves free. Their leading doctrine is that of "internal light." They believe that the Holy Spirit or the indwelling Christ alone maketh wise unto salvation and illumines the mind with true and spiritual knowledge of the things of God. Hence they do not consider human learning essential to a minister of the gospel, and have no theological schools or classes for students. Their ministers do not receive a salary, but bestow their labor freely, and in return are freely entertained when their work takes them away from home. The Friends have from the start, by example and precept, urged "plainness of speech, behavior, and apparel"; and hence a Friend could always be distinguished by certain outward peculiarities, such as "thee and thou, first month, second day," etc., instead of the usual terms used, and by their quaint garb. In 1827, Elias Hicks denied the divine authority of the Scriptures, the divinity of Christ and his atonement, and carried with him about one-half of the society in America. These are now known as the Hicksite Friends, while the remainder are called Orthodox Friends. The more eminent leaders of this sect have been George Fox, Robert Barclay, Thomas Ellwood, William Penn, John Bright, etc. They number about 120,000, less than 20,000 of them being in England. See Fox's *Journal;* Sewell's *History of the Quakers.*

Quarantine (*kwar'an-tēn*), ("a period of forty days"), is a forced abstinence from communication with the shore which ships are compelled to undergo when they are last from some port or country where certain diseases held to be infectious, as yellow fever, plague, or cholera, are, or have been raging. Where a quarantine is established, it is a punishable offense for any person in the suspected ship to come on shore, or for anyone to disembark any merchandise or goods from her, except at lazarettos, which are establishments provided for the reception of goods or passengers or crew, and where such purifying processes as the sanitary science of the time prescribes are applied. Until a ship is discharged from quarantine, she displays a yellow flag at her masthead if she has a clean bill of health, and a yellow flag with a black spot if not clean; at night a white light is shown at the same place. The permit to hold intercourse after performing quarantine is called "pratique." Quarantine is not of necessity limited to a sea-frontier; it is enforced at the frontiers between adjacent states, and by cities and towns on houses in which are cases of infectious diseases.

Quar'termas'ter, an officer whose duty is to provide quarter, provisions, storage, clothing, fuel, stationery, and transportation for the army, and superintend the supplies. In the navy, the quartermaster is a petty officer who attends to the helm, binnacle, signals, and the like, under the direction of the master.

Quartet', a piece of music arranged for four solo voices or instruments, in which all the parts are obligato — that is, no one can be omitted without injuring the proper effect of the composition. A mere interchange of melody, by which the parts become in turn principal and subordinate, without the interweaving of them, does not constitute a quartet. Quartets for stringed instruments are generally arranged for two violins, a viola and a violoncello, and are sonata in form — that is, have a progression of thought and movement. They originated with Haydn, and were further developed by Mozart, and notably by Beethoven, who perfected the art of part-writing in music. Subsequent writers are Schubert, Spohr, Mendelssohn, Schumann, and Brahms. Vocal quartets were a frequent feature in oratorios and operas, up to the time of Wagner.

Quartz (*kwarts*), the name of the commonest mineral substance of nature. Chemically, quartz is silicon oxide ($Si O_2$). Quartz occurs in nature in both the crystalline and non-crystalline forms. When crystalline, it occurs in six-sided prisms, terminated by pyramids. Well-developed crystals are most commonly found in veins or open spaces in rocks. By far the larger part of quartz, even that which is really crystalline, does not occur in the form of prisms, but in the form of sand grains, pebbles, etc., which were themselves derived from crystals. Quartz is one of the constituent minerals of most light-colored igneous and metamorphic rocks, is the chief constituent of most sandstone, and an important constituent of most other sorts of sedimentary rock, except limestone. It is the hardest of the common minerals. Pure quartz is transparent, but it often contains impurities which give it distinctive, and sometimes beautiful, colors. Several varieties of quartz constitute gems, some of them of great value. Here belong *amethyst*, a transparent purple variety of quartz; *agate*, the banded variety of quartz from which cameos are cut; *chalcedony*, a translucent variety; *smoky quartz; cat's eye quartz; jasper*, a red, opaque variety; various so-called *topazes* (not the true topaz); *rose quartz*, a pinkish or rose-tinted variety; *rock crystal*, or crystals of pure quartz. *Flint* and *chert* are impure varieties of quartz.

Quassia (*kwosh'i-a*), from the name of a negro, Quassy or Quash, who prescribed this article as a specific for fevers — a bitter wood obtained from the various trees of the quassia family, all of which are natives of tropical America or the West Indies. The wood and bark are used as medicine. Cabinet wood made from it is safe from all attacks of insects.

Quay (*qud*), **Matthew Stanley,** United States senator and Republican politician, was born at Dillsburg, Pa., Sept. 30, 1833, graduated in 1850 at Jefferson college, and four years later was admitted to the bar. In the Civil war, he served as colonel of one of the Tennessee volunteer regiments, was military state agent at Washington, and military secretary to the governor of Pennsylvania. He entered the State legislature in 1865, was twice state secretary, state treasurer, and chairman of the Republican National committee during the Harrison campaign of 1888. In 1887, he was made United States senator for Pennsylvania, and two years later was tried for alleged misappropriation of public funds, but was acquitted. He was re-elected to the United States senate in 1901.

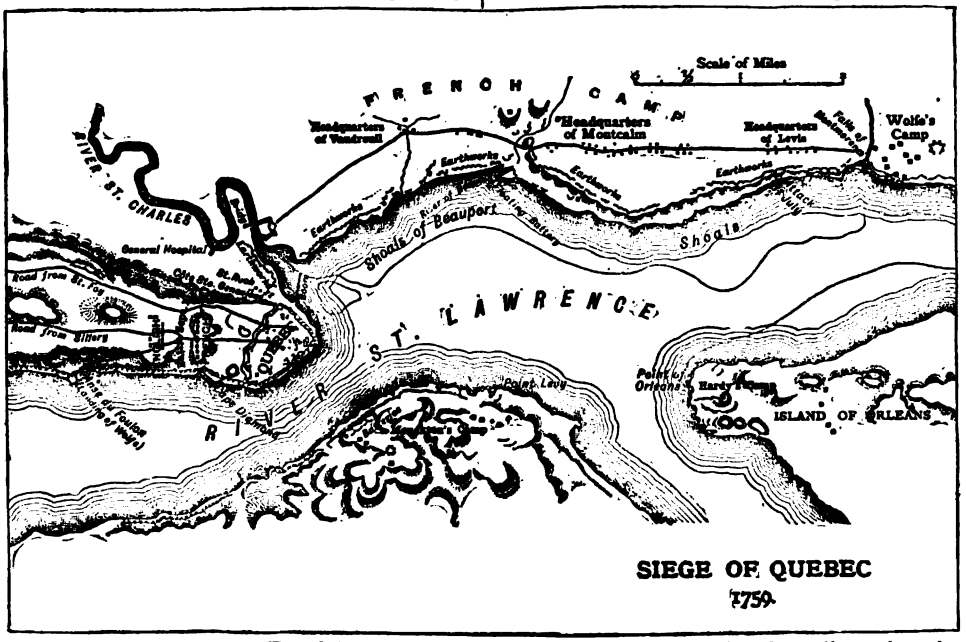
Quebec', Province of. This, the oldest province of the Canadian Dominion, with an area of 228,900 square miles, entered Confederation in 1867. Its population to-day is returned as 1,620,974. It extends northeastward from the Ottawa river (the boundary between it and Ontario) to Labrador, the northeastern confines of the Dominion. It is bounded on the north by the Wotshish mountains and the Northeast territory, of which Ungave is the chief, though as yet an unorganized district. Its southern and eastern boundaries are Ontario, New York state, Maine, and New Brunswick; while the St. Lawrence divides it, and, below Quebec, begins to branch out to a noble estuary, when it reaches the gulf of St. Lawrence. The latter forms the southern exit to the Atlantic (between Newfoundland and Cape Breton), while beyond the large island of Anticosti, at the mouth of the St. Lawrence, the straits of Belle Isle form the northeastern exit. The St. Lawrence is navigable, for the largest ocean-going steamers, as far as Montreal, nearly 600 miles from its mouth. Beyond this the channel is obstructed for a space by rapids and falls, but these hindrances to navigation are overcome by a system of canals which permit vessels of 500 tons to pass up to the western lakes. The chief tributaries of the St. Lawrence are the Ottawa, the St. Maurice, and the Saguenay, upon the northern bank, and the Richelieu, the St. Francis, and the Chaudière, upon the southern. The Ottawa has several falls and rapids, but below the federal city of Ottawa it is navigable, with one short interval, to Montreal. The Saguenay is the gloomy outlet for the cold water of Lake St. John. Few sights in Canada are more grand and awe-inspiring than this grim river (sometimes called "the river of death"), chasm-cleft through the heart of a mountain wilderness. On the way to the Saguenay, from Montreal, the tourist will come to the ancient capital of

Quebec, curious as a survival of the past, and an interesting specimen of the half monastic, half military towns of Old France in the days of the Grand Monarque.

Just below the city of Quebec are the noted falls of Montmorency, which empty into the St. Lawrence. Several of the rivers are navigable for the greater part of their course, while others are used in floating timber, and besides supply almost unlimited water-power to manufacturing industries. Quebec has numerous lakes, of which the best known are Temiscamingue, Metapedia, Temiscouata, Memphremagog, and St. John.

The climate of Quebec is very much like that of the other parts of eastern Canada, excepting, perhaps, that the winter is slightly colder; but the air is generally dry and bracing, and the cold is not felt to be unpleasant, and the climate is exceedingly healthy. The soil is rich and loamy. Cereals, hay, and root-crops grow everywhere in abundance. Indian corn, hemp, flax, and tobacco are also raised in many parts of the province. Fruit is grown in quantities, especially apples and plums, which are exported largely. Small fruits, grapes, and tomatoes are abundant. Cattle breeding is carried on largely, and many thousands of animals are exported to Great Britain yearly, the region east and north of the St. Lawrence being especially excellent for pasturage. The fisheries in the river and gulf of St. Lawrence are very productive, and all the smaller rivers teem with fish. The province is rich in minerals. Iron is very generally distributed; other minerals, such as lead, silver, platinum, zinc, copper, and alluvial gold are found in various places, while the asbestos deposits and those of phosphate of lime are being increasingly worked. Agriculture and dairy-farming form the chief occupation of the people, but manufactures, the fisheries, and commerce, lumbering, mining, and shipbuilding employ a considerable part of the inhabitants.

The province is governed by a lieutenant-governor, who is appointed by the governor-general, an executive council, consisting of 24 members appointed for life, and a legislative assembly of 74 persons, elected every four years. The seat of the local government is Quebec. The province is represented in the Dominion senate at Ottawa by 24 members, and in the house of commons by 65 members. The population consists largely of French-Canadians, descendants of the French settlers living in the country when it was transferred to Great Britain in 1763. In religion the Roman Catholics prevail, but the Protestant churches flourish in the different cities, and the rights of the minority, both in religious and educational matters, are protected by statute. Education is under the supervision of a council, which is divided into two committees for the government of Roman Catholic and Protestant schools respectively. The two Protestant universities are M'Gill at Montreal and Bishop's college at Lennoxville; Laval, the Catholic university is at Quebec. The principal city in the province is Montreal, which is the commercial metropolis of the Dominion of Canada. Quebec, the next city in importance, is, as has been said, the seat of local government, and



SIEGE OF QUEBEC
1759.

the most historic city in Canada. See *Quebec, Past and Present*, by Sir J. M. Lemoine; *Picturesque Quebec; Sketch of the Province*, by the Hon. Honoré Mercier; Cassell's *Picturesque Canada*, edited by Principal Grant.

Quebec', capital of the province of that name, stands on a steep promontory of the St. Lawrence at its junction with the St. Charles river, 300 miles from the gulf of St. Lawrence, and 180 miles below Montreal. Quebec is the most important military position in Canada. The citadel occupies an area of 40 acres and commands a magnificent view. The harbor is spacious, and the docks and tidal basin are perfect specimens of engineering skill. The city is divided into an upper and a lower town. In the latter, are situated the banks, warehouses, and wholesale and retail stores. In the upper town are the principal residences, public buildings, churches, gardens, and retail shops. Toward the west are the thriving suburbs of St. John, St. Louis, and St. Roch's. The last named has become a place of commercial importance, with its immense warehouses and stores. To the southwest of St. John are the plains of Abraham, the historic battlefield, where a column 40 feet in height has been erected to the memory of General Wolfe. Another monument, 65 feet high, dedicated to Wolfe and Montcalm, is situated in the governor's garden and immediately overlooks the St. Lawrence. Four martello towers occupy elevated positions. In the upper town is Dufferin terrace, 1,400 feet long and 200 feet above the water level, commanding a noble view. Three handsome modern gates have replaced the old gates. The principal buildings are the courthouse, post office, customhouse, city hall, masonic hall, basilica, archepiscopal palace, Anglican Cathedral, Church hall, Young Men's Christian Association building, and the parliamentary and department buildings. Laval university, named after the first Roman Catholic bishop of Quebec, who founded the seminary in 1663, is an important institution. The building is spacious, well equipped, and contains a library of 90,000 volumes. Quebec is connected with all the cities in America by various lines of railroad, and on the St. Lawrence is, with Montreal, at the head of ocean steamship navigation to Europe. See *Illustrated Quebec*, by G. Mercer Adam. Population 68,834.

Queen Char'lotte Islands, a group lying to the north of Vancouver island, off the coast of British Columbia. Area 5,100 square miles. The two principal islands, Graham and Moresby, have a length of 160 and a greatest breadth of nearly 70 miles. The climate is healthy, but very rainy. Anthracite coal, copper, and iron ore, and gold-bearing quartz have been found, and forests abound. The inhabitants are about 2,000 Indians, who engage in fishing.

Queen Char'lotte Sound is a strait separating Vancouver island, B. C., Canada, on the north, from the mainland.

Queens'land. The youngest and third largest of the Australian colonies, has an area of 668,497 square miles, about twenty-five times the size of Great Britain. The colony, which forms a province in the British commonwealth of Australia, was organized December, 1859, on its separation from New South Wales. It occupies the northeast part of the continent, to the north of New South Wales, and to the east of the Northern Territory of South Australia. Its population is 512,604. It is 1,300 miles in length from north to south and its greatest breadth is 800 miles; and lies between the 10th and 29th parallel of south latitude, and its western boundary is the 138th parallel of longitude. The coast line is 2,250 miles in extent. About 50 miles from the sea, and more or less parallel with the eastern coast, is a backbone of mountains, and upon this belt of land settlement has chiefly taken place. The main dividing range is a continuation of the bolder Australian Alps of Victoria and the famous Blue mountains of New South Wales. The highest peaks are Bellenden-ker (5,500 feet) and Mt. Dalrymple (4,250). The mean altitude of the range is 2,000 feet. On the east side, Queensland is ridgy and thickly timbered with the eucalyptus. The country to the west of the mountains is very largely open downs and plains, making the finest pasturage in the world. It is fairly well watered, having rivers flowing in four directions, and those in the east have helped to create important industries and thriving ports along the island-studded coast. As two-thirds of Queensland lie within the tropics, there is a wide variety of climate and productions. For seven months of the year the climate is most enjoyable and healthy, being free from the scourges of consumption and contagious diseases. Invalids sent here in what appear to be the last stages of consumption often regain health, and usually live to become old. The rainy season commences in the tropical portion at midsummer (Christmas time) and lasts till March. Much of the marked prosperity of Queensland is due to her facilities of steam communication by ocean and with other colonies. Great progress has been made in the development of railways, and the system is now directly connected with that of New South Wales. The railways, telegraphic service, and the post office is under state control. Queensland is rich in mineral resources, especially gold. It is estimated that since 1868 its mines have produced $120,000,000. The gold production for the year 1899 amounted to 946,894 ounces of the value of $1,410,000. The province yields also silver, tin, copper, opal, wolfram, and manganese. In central Queensland, is to be found the remarkable Mount Morgan mine. It is supposed

that this unique formation, 1,225 feet above the sea level, was once a hot spring, the water of which held in solution gold which was precipitated (thrown down) along with other mineral matter into the curious stone, which has proved to be the most wonderful gold-bearing material in the world. The capital is Brisbane, population (exclusive of South Brisbane), 30,000.

Queens'town, a seaport of Ireland, on the south side of Great island, in the harbor of Cork, 177 miles southeast of Dublin. Its original name was Cove of Cork; the present name is in memory of the visit of Queen Victoria, in 1849. The town is built in parallel streets on the slopes of a hill shaped like an amphitheatre. It is noted for

its mild and healthful climate. The splendid Roman Catholic cathedral for the Clyme diocese is the principal building. Queenstown is an important port of call, the mails from the United States being landed here and sent overland to Dublin. Population 10,000. See an article in *Harper's Magazine*, September, 1884.

Queretaro (*ka-rā'tă-rō*), one of the island states of Mexico, also a city of the same name, situated on a high plateau, 120 miles northwest of Mexico City, and 350 miles from Vera Cruz. The area of the state is 3,556 square miles, with a small population (225,000). The population of the city, its capital, is 34,576. The town was taken by the Spanish from the Chichimec Indians in 1531. Here, in 1867, Maximilian, archduke of Austria and emperor of Mexico, made his last stand, and here he was shot. The town is an important manufacturing center, and near it are some rich mines of silver, lead, iron, and copper. The chief product of the region, however, is maize, fruit, and cotton. There are some fine public buildings, and a church (that of Santa Clara) noted for its beautiful wood-carvings.

Quern (*kwĕrn*), a mill used in early times for grinding corn, the stone of which was turned by hand. It is a contrivance of great antiquity, and so well adapted to the wants of a primitive people, that we find it at the present day in remote districts of Ireland, and in some parts of the Hebrides and Shetlands. The remains of querns have been dug up in Britain, Ireland, and continental Europe, wherever the traces of ancient population are found. The most usual form of quern consists of two circular flat stones, the upper one pierced in the center with a narrow funnel, and revolving on a wooden or metal pin inserted in the lower. The upper stone is occasionally ornamented with various devices; in the Roman period, it is sometimes funnel-shaped, with grooves radiating from the center. In using the quern, the grain was dropped with one hand into the central opening, while with the other the upper stone was revolved by means of a stick inserted in a small opening near the edge.

Quick'sand (quick, *i. e.* "living" or "moving" sand), a tract of sand which, without differing much in appearance from the shore of which it forms a part, remains permanently saturated with water to such an extent that it cannot support any weight. Quicksands are most often found near the mouths of large rivers. They appear to be formed only on flat shores, the layer of earth under the sand being stiff clay, which water cannot pass through. Also in narrow channels through which the adjoining shore, from its shape, causes strong tidal currents to run, the sand may be kept so constantly stirred up by the moving water that a quicksand results. Quicksands are not commonly of great extent, and their danger has probably been exaggerated in the popular mind by sensational descriptions in works of fiction, as in the *Bride of Lammermoor*, and in *Moonstone*.

Quick'silver. See MERCURY.

Quin, James, a celebrated actor, was born at London, of Irish descent, in 1693, and made his first appearance on the stage at Dublin in 1714. Shortly after, he was engaged at Drury Lane, London, but for quite inferior parts. In 1716, however, the sudden illness of a leading actor led to Quin's being called on to take the character of "Bajazet," in the once-famous play of *Tamerlane*. His success was marked. Next year he went to Rich's Theatre at Lincoln's Inn Fields, where he remained as a principal actor for seventeen years. The only really fine parts which he seemed to have played were "Captain McHeath," in the *Beggar's Opera*, and "Falstaff," in the *Merry Wives of Windsor*. In 1734, he returned to Drury Lane Theatre, "on such terms," says Cibber, "as no hired actor had before received;" and from this date until the appearance of Garrick, in 1741, he was by universal consent the first actor in England. He died at Bath, Jan. 21, 1766.

Quince, the fruit of a species of *Pirus* (*P. cydonia*), a member of the rose family. The species is sometimes regarded as entitled to separate generic rank, and is then called *Cydonia vulgaris*. It is said to be a native of northern Persia, but is naturalized throughout the northern hemisphere. There are only

three principal varieties of quince in cultivation, namely, those in which the fruit is apple-shaped, those in which it is pear-shaped, and the so-called Portugal quince, which has very large fruit.

QUINCE.

Quin'cy, the third city in Illinois and county seat of Adams county, is on the Mississippi river near the fortieth parallel of latitude, and was founded in 1822 by John Wood. It has steadily grown into a manufacturing city of considerable importance. Among the many manufactured articles are stoves, farm implements, incubators, metallic wheels, stationary engines and engine supplies, furniture, clothing, carriages, paving and building brick, lumber and lime. In addition to several railroad lines, the city has advantage of the river transportation. The public institutions include a free library of 22,000 volumes, a fine courthouse, soldiers' and sailors' home, hospitals, churches, government building and many beautiful parks. The city has thirteen public school buildings with an enrollment of 5,000, twelve parochial schools with an enrollment of 2,500, two large business colleges and several private schools. The city is noted for its beautiful shade trees, paved streets and healthful situation on a bluff above the river. Population 36,252.

Quin'cy, Josiah, an American lawyer, was born at Boston, Feb. 23, 1744, and died at sea, off Gloucester, Mass., April 26, 1775. After graduating at Harvard, in 1763, he studied law. He took a strong stand against the oppressions of the parliament of the mother country and its violations of the rights of the colonists, and his name is associated with those of James Otis and Joseph Warren as men who had most influence in bringing about the Revolution. Although Quincy had a slender frame and ill-health, his gift of oratory, heightened by a voice of rare beauty and compass, and an impassioned and graceful delivery, had great weight in public assemblies. When Captain Prescott and the soldiers who fired on the people in the Boston massacre of March 5, 1770, were arrested, Josiah Quincy and John Adams were applied to in their behalf to act as their counsel, and, although they earned great reproach by doing so, the acquittal of the prisoners on trial the next autumn justified their course. In May, 1774, he published his chief political work, *Observations on the Boston Port Bill, with Thoughts on Civil Government and Standing Armies.* In September, 1774, he went to England on a private mission for the popular cause, as well as for his health. This visit excited much notice in London. He had interviews with Lords North and Dartmouth at their own request, had intercourse with Dr. Franklin and other friends constantly, and received the most bitter personal abuse from Lord Hillsborough. He returned early in the spring, against the advice of his physician, and died just before arriving. Almost his last words were that he could die content if he had an hour's talk with Samuel Adams or Joseph Warren. See his *Life*, by his son, Josiah Quincy (1820).

Quin'cy, Mass., an historic town and seaport of Norfolk county, on the Quincy river and bay, 8 miles south of the city of Boston. It is notable for its extensive shoe manufactories, and its large granite quarries in the neighborhood. It has a number of fine parks, some excellent schools and academies, public library (The Thomas Crane library), together with other civic and social institutions. It is served by the N. Y., N. H., and Hartford railroad. Quincy was the birthplace of the three early American statesmen, John Hancock, John Adams, and John Quincy Adams. Population 23,899.

Quinine (*kwī-nēn*, or *kwī-nīn*), is an alkaloid present in the bark of numerous species of cinchona and in one species of remigia, its yield varying from 1½ to 8 per cent. Quinine is obtained from the powdered bark by treating it with lime, and then extracting the mixture with alcohol, neutralizing with an acid so as to obtain a salt of quinine, and finally purifying the product. Preparations of quinine, especially the sulphate, are largely used in medicine.

Quinoa (*kwī-nō'a*), a valuable food-plant, a native of Chile and the high tableland of Mexico. In these countries it is much cultivated for its seed, which forms a principal food of the inhabitants. The meal made from some varieties of the seed has a somewhat peculiar flavor, but it is very nutritious, and is made into porridge and cakes.

Quintil'ian, M. Fabius Quintilianus, was born about 35 A. D., at Calagurris, in Spain, and attended the lectures of Dimitius Afer in Rome. After 59 A. D., however, he revisited Spain, whence he returned to Rome in the train of Galba and began to practice as a pleader in courts, gaining there a considerable reputation. He was more distinguished as a teacher of oratory, however, and his instructions were eagerly sought after, his pupils, including the younger Pliny and the two grand-nephews of Domitian, who conferred on him the title and insignia of consul. After twenty years of labor as advocate and teacher, he retired to private life and died about 95 A. D. His reputation rests securely on his great, but mutilated, work, entitled *Institutions of Oratory*, a complete system of rhetoric. It was written after he had ceased to be a teacher, and was the fruit of two

years' labor, as he says in his preface. The best edition of Quintilian's work is that of Burmann; of the *Institutione Oratoria*, those by Spalding, completed by Zumpt and Bonnel.

Quipu (*kē'pō*), the language of "knotted cords" which was used by the Incas of Peru previous to the conquest of their country by the Spaniards. A series of knotted strings was fastened at one end to a stout cord; the other end hung free. This was used for the purpose of conveying commands to officers in the provinces, and even for recording historic events.

Quito (*kē'tō*), the capital of Ecuador, lies in 0° 14′ south latitude, on the east side of the great plateau of Quito, at the foot of the volcano of Pichincha, at an elevation of 9,351 feet above the sea. Its site, cut up with numerous ravines, is very uneven; but the streets are laid out regularly at right angles, plunging into and scaling the sides of the valleys which come into their course. The city is well paved, but the sidewalks are very narrow; and the streets are lighted only with candles or kerosene lamps — oftenest those placed before shrines at the street corners. The appearance of Quito is very picturesque, with its beautiful mountains on every side. This, together with its clear, healthy, and temperate climate, maintaining a perpetual spring, makes it one of the most charming cities of South America; yet the abrupt changes from the hot sun of midday to the chills of evening make pneumonia and diseases of the chest very common. The principal houses are built of stone, the others of adobé, or sun-dried bricks, covered with tiles. In the great square stand the quaint cathedral, with its green-tiled dome, the archbishop's palace, the municipal building, and the capitol, built of brick and stucco, with the two halls of congress on the third floor. Other public buildings include the university, a seminary, an institute of science, an observatory, a museum, a library of 20,000 volumes, a penitentiary, a hospital, a lunatic asylum, a retreat for lepers, a score of churches, and three times as many monasteries. Most of these last are in a dilapidated condition, for which it is hard to find any reason but laziness; for they still retain their lands and revenues, and the offerings of the faithful, who are nearly all Indians, are as constant as ever. Indeed, Quito is the paradise of priests, of whom there are more than 400 in the city, and the bells are jangling all day long; for Ecuador is the most faithful province of the pope, and the one state in the world which still refuses to recognize the unity of Italy, and the condition of affairs which resulted from the occupation of Rome. There are only two or three good stores and no hotels; the daily market in the square before the monastery of San Francisco is the general purchasing place, and the religious houses serve for hotels. Quito was founded in 1534, and has suffered frequently from earthquakes. Population about 80,000, mainly Indians and Mestizoes (half-Spanish or Creole and half-Indian).

R

Rabat (*rȧ-bȧ'*), also called New Sallee, a seaport city of Morocco, Africa, is situated on the south side of the Bu-Regreg, where it empties into the Atlantic ocean. The most conspicuous object in the town is the tower of Beni-Hassan (180 feet high); and near it is the ruined mosque of Almanzor, originally intended to be the largest in the world. Formerly Rabat was the center of the European trade with Morocco; but owing to the silting up of the mouth of the river, its commerce has greatly declined. Its chief exports are goat and sheep skins, hides, wool, almonds, wax, and gum. Population 26,000.

Rab'bi, an honorary title applied to teachers and masters of the Jewish law, being in common use in the time of Christ, who was frequently addressed as such by his disciples. Other forms of the same title are *Rab*, "master," *Rabbān*, "our master," and *Rabboni*, "my master."

Rab'bit, a rodent with long ears, belonging to the same genus as the hares. The distinction between the rabbit and the hare is indefinite and shadowy. The smaller burrowing varieties are usually called rabbits, and the larger ones, and those that do not construct a burrow, are called hares. They feed on grass, herbs, and tender bark. Those kept in captivity will eat nearly all kinds of vegetables and at times should be given dry food, like shelled corn. The tame rabbits have been modified and varied by selection and breeding. They multiply rapidly, having from four to eight litters a year. The young rabbits are naked and blind at birth, and are cared for in the burrows. They were introduced into Australia about the middle of the 19th century, and into New Zealand in 1860. They multiplied till they were a great menace to the crops of the farmers and to vegetation in general. The government offered a bounty for their skins, and in a single year more than twenty-five millions were killed in New South Wales alone. Their skin is of little value, but their hair has been used in making the body for felt hats. See HARE.

Rabelais (*rȧ-blȧ'*), **Francois,** the greatest of French humorists, was born, according to the general statements of biographers, in 1493, but more probably a few years later, near Chinon, a small town in Touraine. At the request of his father, he became a brother of the order of St. Francis in the convent of Fontenay-le-Comte about the year 1519, and at once devoted himself with the utmost ardor to his hitherto neglected studies. To medicine in particular he seems to have been strongly attracted, and, in addition to the Latin and Greek languages, he is said to have mastered Italian, Spanish, German, Hebrew, and Arabic. Charged with heresy on account of his devotion to learning, he left the convent, and later was in turn a monk of the order of St. Benedict, lecturer in the university at Montpellier, and canon of Cardinal Bellay's abbey near Paris. He died at Paris, April 9, 1553. Rabelais' great romance, in which are narrated the adventures of Gargantua and Pantagruel, continues to held its rank as a masterpiece of humor and grotesque invention. In the form of a sportive and extravagant fiction, it is a pointed criticism of the corrupt society of the period, the follies and vices of which are pictured with marked ingenuity and effect; but, at the same time, on account of its free tone and plainness of speech, few books are less suitable for general perusal.

Raccoon (*rȧk-koon'*), a tree-climbing, nocturnal animal, belonging to the bear family and restricted to North and South America. The common "coon" of the United States is widely distributed. It has a stout clumsy body, about two feet long without the tail, which is about a foot in length. The long coarse hair of the body is grayish brown and the tail is ringed with black and white. It has a broad head and a pointed muzzle, and the face is crossed by a dark band which includes the eyes. The home of the animal is usually high up in the hollow of a large tree; here it rests by day and hibernates through the severe winter weather. It is active at night, and, during the season of young corn, is often very destructive to the green ears. Besides corn, in season, its usual food is fish, crayfish, and various mollusks, though it also eats mice, insects, fruits, small birds, eggs, etc. It has the curious habit of washing or dousing its food repeatedly in the water, and by the Germans is called the "wash-bear." The common raccoon of South America is called the crab-eating raccoon. A coon hunt on a moonlight night, with torches and dogs, is a common form of sport in the United States.

COMMON RACCOON.

Ra'ces of the World. The most general division of the human family is into five great races: the Caucasian, the Mongolian, the Malay, the Ethiopian, and the American. The Caucasian race is the most numerous and the most widely spread over the earth of all the races. It is distinguished by a fair complexion, a high forehead and straight hair,

and beard varying in color. This race is dispersed over nearly the whole of Europe and North America, Northern Africa, and large areas in Asia, Australia, and southern Africa. It leads the other races in literature, commerce, and all the arts of civilization. The Mongolian race has a yellowish complexion, small eyes, prominent cheekbones, and rather coarse black hair. It comprises the Chinese, the Japanese, the Turks, and many other nations in Asia, together with the Magyars of Hungary and the Esquimaux of North America. The Malay race has a dark-brown complexion, with a skull like the Caucasian; a flat face like the Ethiopian; and straight dark hair like the Mongolian. This race is found in Madagascar, Australia, the islands of the Pacific, and in the Malay peninsula in Asia. The Ethiopian, or African, race has a black complexion, a rather low forehead, a broad, flat nose, thick lips, thin beard, and woolly hair. It inhabits the greater part of Africa, although it has several million representatives in North America. The American race (Indians) has a red or copper-colored skin, high cheek bones, coarse, black hair, and scanty beard. It is found in certain portions of North America and South America. The population of the world may be estimated in round numbers at 1,500,000,000, of which more than 1,000,000,000 belong to the Caucasian and Mongolian races. Various divisions and sub-divisions of these races have been made by ethnologists during the last twenty-five years.

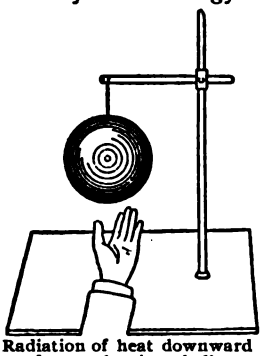
Ra'chel, properly **Elisa Rachel Felix,** the great French tragic actress, was born of Jewish parents at Mumpf, in the Swiss canton of Aargau, March 24, 1820. She had her first lessons in singing at Paris about the year 1830, when her parents took up their residence in that city, and in 1838 appeared as "Camille" in *Les Horaces* in the Théâtre Français. From this time forward she shone without a rival; and the furore excited in Paris in 1848 by her recitation of the *Marseillaise* will continue to connect her name with the revolution of that year. In 1849, she made the tour of the French provinces, and afterward visited London, St. Petersburg, Berlin, and other great cities of Europe, everywhere meeting enthusiastic admiration and applause. In 1855, while on a professional visit to America her health gave way, and she returned home utterly prostrated, her death taking place at Cannes, near Toulon, Jan. 3, 1858. As an artist, within the limits prescribed by her genius, Rachel has never been surpassed. No language can give an idea of the force and intensity which characterized her rendering of passion. Her *Phèdre*, by common consent her masterpiece, was the very incarnation of agony, not to be forgotten by anyone who ever heard it. "She does not act — she suffers," a fine critic has observed of her. But in spite of her great genius she was never tenderly loved, being grasping and avaricious. She left a large fortune, besides the amounts lavished upon her family during her life.

Racine', Wis., is a prosperous manufacturing city, having a population of 29,102, situated at the mouth of Root river, 23 miles south of Milwaukee. Being situated on a bluff, fifty feet above the waters of Lake Michigan, gives the city of Racine an excellent drainage, as well as a beautiful view of the lake.

Racine is noted for the manufacture of wagons, thrashing machines, boots and shoes, boilers, engines, boats, and malleable iron. There are three banks, a public library, and an excellent system of public schools.

Racine (*rä-sēn'*), **Jean Baptiste,** the greatest dramatic poet of France, was born at La-Ferté-Milon, in the modern department of Aisne, in December, 1639. His parents dying when he was very young, he was cared for by his maternal grandfather, being sent first to the college Beauvais and afterward to Port Royal, at which latter place he studied diligently under such masters as Claude Lancelot, Nicole, and La Maitre. At the age of nineteen he left Port Royal to pursue a course of philosophy at the collège d'Harcourt, where he appears to have first felt the attractions of a life devoted to letters, and to have become intimately acquainted with various actors and actresses. Racine's earliest play was acted by Molière's company at the Palais Royal théâtre, in June, 1664, and in the same year he received from the king a pension of 600 francs for a congratulatory ode. The next fifteen years Racine devoted to writing plays and produced a number of works, all of which bore the stamp of very high, if not the highest, genius. His last production, *Phèdre*, which appeared in 1677, was the one in which Rachel's genius, in the 19th century, reached its highest manifestation. After this Racine professed conversion and married a noble woman, who bore him two sons and five daughters. Besides the income derived from his works, he filled a number of profitable offices under the king, and divided his time between the duties of these offices and the practice of various religious exercises. In his later years he wrote a memoir on the miseries of the people at which the king is said to have expressed his displeasure in words that broke the heart of the courtier-poet, and doubtless hastened his death. He wrote a long letter to Madame de Maintenon to clear himself of the charge of Jansenism; but in recounting the miseries of the French people he had committed an offense which such a monarch as Louis XIV. could not forgive, and he never recovered the royal favor that appeared so very dear to him. His chief writings are *Esther*, *Athalie*, *Phèdre*, *Bajazet*, and *Iphigénie*. He died at Paris, April 21, 1699, and was buried according to his own request at Port Royal.

Radia'tion, one of the fundamental processes by which energy is transmitted from one point to another. The word is sometimes used also to denote the quantity of energy transmitted as well as the process. If one considers the incandescent carbon filiment of an ordinary electric lamp and holds his hand under either at the side of or underneath it, the sensation of heat is distinctly recognized. The same is true when the hand is placed some inches underneath a heated ball which is not emitting any light at all. The query arises as to how the heat gets from the ball down to the hand. It is certainly not by conduction, for air is one of the very poorest of conductors. Nor can it be by convection, for convection currents heat only the regions above the lamp or ball. Now it has been proved by elaborate series of experiments, extending over the entire 19th century, and performed by Herschel, Prevost, Carnot, Melloni, Balfour Stewart, Kirchhoff, Hertz, and others, that this "something" which passes from the ball to the hand behaves exactly as light waves behave in nearly all particulars. It travels with the same speed as light, can be polarized as light, can be reflected and refracted as light, etc. The unavoidable inference is, therefore, that that which we call heat in the ball and heat after it is received by the hand is *not* heat while traveling from the ball to the hand, but is a wave motion in the ether just as light is, the principal difference being that the heat waves are longer than the light waves. This is a process known as *radiation*, and the energy thus transmitted, whether in the form of long heat rays, or luminous rays, or so-called actinic rays, or electrical vibrations, is all grouped under the head of *radiant energy*. The student should distinguish carefully between *heat*, which is the energy of motion resident in atoms and molecules of ponderable matter, and radiant energy as defined above. See Balfour Stewart's *Treatise on Heat*.



Radiation of heat downward from a hot iron ball.

Radiometer (*rā-dĭ-ŏm'ĕ-tĕr*), an interesting device discovered by Sir William Crookes in 1873, while determining the atomic weight of the then recently found element, *thallium*. In the form in which Crookes left it, the essential features are a windmill of four light mica vanes placed in a glass bulb B from which the air has been very completely, but not too completely, exhausted. The proper degree of exhaustion is that in which the mean free path of the molecules is a little greater than the perpendicular distance from one of the vanes to the wall of the glass bulb. As shown in the figure, the vanes are blackened on one side, and when sunlight or even lamplight is allowed to fall on the instrument the vanes showing the blackened sides are more heated than the others, and hence the molecules between the blackened vanes and the glass wall bombard the vanes away, giving rise to the rotation indicated by the arrow in the figure.

RADIOMETER.

Only recently the radiometer has been made an instrument of precision, principally through the labors of Prof. E. F. Nichols of Dartmouth college. For a description of this instrument, see *Astrophysical Journal*, March, 1901, pp. 101–41.

Radiomicrometer (*rā'dĭ-ō-mī-krŏm'ĕ-tĕr*), an instrument of marvelous sensibility for detecting radiation. It consists essentially of a thermoelectric couple suspended between the poles of a strong permanent magnet. The thermoelectric couple is a part of a short electric circuit, all of which is freely suspended. When one junction in this circuit is exposed to radiation, an electric current is produced and the suspended coil rotates exactly as does the coil in an ordinary D'Arsonval galvanometer. (See article *Galvanometer*.) To the suspended coil is attached a mirror by which this rotation may be measured. The instrument in its present form was suggested by D'Arsonval, and perfected by C. V. Boys, in whose hands it has been made so sensitive as to detect the radiation of a single candle at a distance of two miles. For its use as an instrument of precision, see article by E. P. Lewis in *Astrophysical Journal*, June, 1895, pp. 1–25.

Rad'ish, a name applied to species of *Raphanus*, a genus of the mustard family, and especially to *R. sativus*, long cultivated, principally for its fleshy roots. It is native to the Old World and many garden varieties have been developed, which may be classed in general as long-rooted and turnip-rooted varieties.

Rae (*rā*), **John,** Arctic traveler, was born at Orkney, in 1813, and, after studying medicine at Edinburgh, went to Hudson bay as physician of the company's ships. In 1845, he undertook an exploring expedition, and in 1846–47 a more extensive one, wintering in Repulse bay. He was second in command, under Richardson, on a Franklin search voyage in 1848; and five years later commanded an expedition that proved King William's Land to be an island. In his journeys, he

traveled more than 1,800 miles over regions that had never before been explored. He died at London, July 24, 1893.

Rag'lan, Lord (**Fitzroy James Henry Somerset**), a British general, was born Sept. 30, 1788. He entered the army in his sixteenth year, and after serving on the staff of the Duke of Wellington in the Copenhagen expedition and the Peninsular war became his secretary in 1812. He lost his right arm in the battle of Waterloo; and for his brilliant services in that campaign he was made a K. C. B. In September, 1852, he was made master-general of the ordnance, and a month later was called to the house of peers as Baron Raglan. When war was declared against Russia, in 1854, Lord Raglan was appointed commander of the English forces in the Crimea, and at the desperate battle of Inkerman, he won the baton of a field-marshal. The siege of Sebastopol continued until June 18, 1855, when a general assault was ordered, at which both English and French troops suffered terrible losses. Raglan had a slight attack of cholera, and this disaster weighed so heavily on his mind that he died a few days later, June 28, 1855. See Kinglake's *Invasion of the Crimea.*

Rag-stone, an impure limestone, consisting chiefly of lime and silica, much used for whetstones and building material.

Ragusa (*rȧ-gōō'sȧ*), a decayed city of Dalmatia, Austria-Hungary, stands on the east shore of the Adriatic, opposite the gulf of Manfredonia in Italy. For several centuries Ragusa was a Roman outpost on the edge of the Slav states, and flourished greatly under the protection of the Byzantine empire. Toward the end of the 12th century, she was made to acknowledge the supremacy of Venice, although allowed many of the privileges of a separate state. At the beginning of the 15th century, she became an independent republic, and at the same period began to take a prominent place among the trading powers of the Mediterranean. In 1806, Napoleon declared the republic of Ragusa at an end; and since 1814 it has belonged to Austria and is fortified by her. Population 12,000.

Raikes, Robert. See SUNDAY SCHOOLS.

Rail, any one of a group of shore birds found in marshes. They have the habit of skulking, instead of taking to wing when pursued, and, therefore, are more frequently heard than seen. They are birds with slender bills, and long powerful legs. They are united with the coots into one family, but the toes of the rails are completely divided, those of the coots are lobed. The Carolina rail, or sora, is the most common one in the United States. It is found in the whole of temperate North America, but is more abundant east during migration, as it breeds chiefly in the northern part of its range. It is about eight and one-half inches long, with the upper parts olive brown, streaked with black; the breast is slaty and the belly white. The Virginia rail is also common. The king-rail, or fresh water mud-hen, is the largest and finest of the American true rails, being about seventeen

RAIL.

inches long. It is common in some sections of the United States. The yellow and the black rails are less common. The common water rail of Europe is found in marshy districts of the British Isles and many parts of Europe. Like the American rails, it nests in the grass.

Rail'roads. The origin of these mighty agents of commerce and civilization may be traced to a contrivance for carrying coal from the mines in Northumberland and Durham, England, to the places of shipment on the Tyne and Wear, which consisted of two parallel lines of wooden beams or trams fixed to the ground and furnished with flanges to prevent the wheels of vehicles from slipping aside. The date of the invention of these tramways is not certain, but it may be safely referred to the first half of the 17th century. The first step in improvement, which was covering the wooden beams with long strips of iron, was taken about the year 1700; and a second and more important improvement which followed some years afterward was the substitution of cast-iron rails fixed on wooden sleepers laid crosswise. This species of railway became pretty general in mining districts during the 18th century; but on account of the opening of canals, and other causes, was not considered practicable as a general means of travel and transportation. After the introduction of cast-iron rails, instead of a single wagon, the plan of linking together several smaller wagons was adopted — the germ of the modern railway train. The next improvement consisted in putting flanges on the wheels instead of the rails, which secured much greater facility of transit. But as no more rapid or powerful means of locomotion had been invented than horse-power, many persons labored to devise some sort of steam apparatus for the purpose. The merit of inventing a self-acting steam carriage is due to Richard Trevethick, who, in the year 1802, took out a patent for a steam locomotive which successfully performed the duty of drawing wagons on rails. Trevethick's in-

vention, however, was too imperfect to come into general use, and for a few years little or no improvement was made upon it, chiefly on account of the mistaken notion among engineers that the steam locomotive could not be made to draw a heavy load or acquire great speed unless it were provided with cogged wheels to work on a corresponding rack along the rails. That locomotives with smooth wheels running on smooth rails could draw heavy loads even up a moderate incline was established as a fact by Mr. Blackett, a coal proprietor on the Wylam railway, in the year 1811; and nothing was now lacking but the means of obtaining speed.

Locomotive power was first employed by George Stephenson, in 1814, on the Killingworth railway, and with such success that it was afterward applied on the Stockton and Darlington railway, which was the first railway in which carriages for passengers were used; but for some time its trains could not be made to move much faster than a walking horse. This difficulty was at length overcome by Stephenson after a number of experiments, by sending the waste steam up a chimney, so as to cause a powerful draught in the fire. A rapid generation of steam was the result, and from this device, in connection with the multitubular boiler, the locomotive of the present day, with its wonderful power and energy, has been derived. But it was some time before the public mind could be brought to consider the question of the general use of railways, and it was not until 1830 that the line from Liverpool to Manchester was formally opened.

The first railroad constructed in the United States was in 1826, and was for the purpose of carrying granite from the quarries near Quincy, Mass., to tidewater, a few miles distant, and in the next year the legislature of Maryland chartered the first railroad company authorized to do a general business in carrying freight and passengers. This was only a little over seventy years ago, and such has been the progress in railway enterprise in that period, especially since the close of the Civil war, that in 1900 there were 190,833 miles of railroad in the country, representing a total capital of about $12,000,000,000. The total railroad mileage of the world has been estimated at 395,000 miles, and the value of all the roads at $35,000,000,000. The mileage of the principal countries in round numbers is as follows: Austria, 20,908; France, 25,673; Germany, 30,000; Great Britain and Ireland, 22,000; Italy, 9,714; Russia, 27,000; Spain, 8,000; Switzerland, 2,260; India, 21,000; Canada, 16,684; Sweden, 6,315; Belgium, 3,667; Japan, 2,504; Mexico, 9,027; Argentine Republic, 10,595; Brazil, 8,718; Chile, 2,841; United States, 190,833.

The longest continuous railway line on the American continent is that of the Canadian Pacific railroad; its main line, from Montreal to Victoria, B. C. is 2,990 miles. The new located Russian Siberian line will have a mileage of 4,775 miles, and with its feeders and branches through Manchuria to Port Arthur will have an estimated length of 6,000 miles.

Rain is caused by whatever lowers the temperature of the air, and causes a part of the watery vapor, with which it is saturated, to assume the liquid state. Various causes may conspire to effect this object, but the most important of these originate in winds and other movements of the atmosphere. The more important principles regulating the relation of the winds to the rainfall are: (1) When the winds have traversed a considerable extent of the ocean before reaching land, the rainfall is large; (2) when the winds on arriving at the land advance into higher latitudes or into colder regions, the rainfall is greatly increased because the air is brought below the point of saturation more rapidly; (3) if the winds, on arriving at the land, at once advance into warmer regions, the rainfall is small; (4) if the winds travel across a range of mountains, the rainfall is largely increased on the side facing the winds, but reduced on the other side. There are certain places on the earth where the rain rarely or never falls, such as the coast of Peru in South America, the great valley of the river Colorado in North America, the desert of Sahara in Africa, and the desert of Cobi in Asia; while, on the other hand, in such regions as Patagonia it rains nearly every day. In all places within the tropics where the trade winds are blowing regularly and constantly, rain is of very rare occurrence, the reason being that as these winds come from a higher latitude their temperature is increasing, and consequently they take up moisture rather than part with it; and the return trade winds, which blow above them in an opposite direction, having previously parted with their moisture, are dry and cloudless. When, however, these winds are forced up mountain ranges, as is the case on the east of Hindustan, they bring rain, which falls chiefly during the night, when the earth is coolest. In respect to the rainfall Europe may be divided into two distinct regions — western Europe and the countries bordering on the Mediterranean. As the southwest winds, which are the return trades, descend to the earth and blow over the surface of Europe, it follows that the western parts, especially where mountain ranges stretch north and south, are rainy districts. Hence the rainiest regions of Europe are Norway, Ireland, the west of England and France, and Spain and Portugal. On the coasts of the Mediterranean it rarely rains in summer, but frequently in winter. In Italy the quantity diminishes as we approach the south; and south of the Alps six times more rain falls with the northeast than with the southwest winds, the exact reverse of the case in England.

The manner of the distribution of rain in the United States is very different from what it is in Europe. The Rocky mountains in Central America are so high as to present an effectual barrier to the passage of the trade winds which blow over the gulf of Mexico, by which means they are turned northward and spread themselves over the country, especially the low basin of the Mississippi. When they have blown for some time vast accumulations of heat and moisture take place, and sometimes great storms arise in consequence, sweeping eastward across the land, and in many cases crossing the Atlantic and descending with violence on western Europe. It appears, in short, that the south winds from the gulf of Mexico spread the moisture over the country, and the northwest winds separate this moisture from them by getting below them and forcing them into the higher regions of the atmosphere. As a consequence of this the heaviest rainfalls are in the valleys and the lightest on higher grounds. Thus the greatest amount of rain falls in Florida, the low flats of the Mississippi, and along its valley, and the least quantity on the Alleghanies, especially on their higher parts, and on the high grounds of the Missouri river. In the northern states the quantity diminishes considerably, and the mode of its distribution is more similar to that of Europe.

Rain'bow, an optical phenomenon of great beauty appearing in the sky when rain is falling from clouds opposite the sun. It consists of a number of concentric arcs whose successive colors are arranged in the same order as the colors of the solar spectrum. There are usually two bows, an upper and a lower. The lower one is always the brighter and is called the *primary* bow; the upper is often very faint, and is called the *secondary* bow. In the primary the colors begin with red at the top and end up with violet at the bottom; in the secondary the order is just reversed.

The explanation of the rainbow was first given by Antonio de Dominis, archbishop of Spalatro, about 1600 A. D., who showed that a glass sphere filled with water would reflect a parallel incident beam of light in such a way as to produce a complete rainbow on a screen surrounding the source of light; but this explanation was, of course, incomplete until Newton proved that color is not produced at the refracting surface, but is due to the decomposition of white light. This experiment of De Dominis can be repeated by going into the "Cave of the Winds" at Niagara Falls where on a bright day the parallel incident beam and the complete rainbow of 360° are easily obtained, the particles of spray replacing the glass bulb filled with water. The primary bow is produced by rays which have undergone *one* internal reflection; the secondary by rays which have suffered *two* internal reflections. The angular width of the primary bow is twice 42° 2′ for the red rays; and twice 40° 17′ for the violet rays. The corresponding angle for the red rays of the secondary bow is 50° 57′; and for the violet rays 54° 07′. For the details of the reflections and refractions here occurring, see any good textbook of physics, such as that of Watson (Longmans & Co., 1899).

Rain-Gauge, an instrument employed by meteorologists to measure the depth of water deposited by rain during any assigned period. In its ordinary form it consists of a funnel, with a mouth of known area, for collecting the rain water in a graduated glass vessel where its mass can be easily determined. Knowing the mass of water precipitated and the area over which it was distributed, the depth may be easily calculated. Several forms of self-registering rain-gauges have been devised, for which see any good treatise on meteorology.

Rain'y Lake, a lake forming part of the boundary line between the Canadian Dominion (province of Ontario) and the United States. It lies 100 miles west of Lake Superior, and is about 55 miles in length. It discharges its waters through Rainy river into Lake of the Woods.

Rai'sins, dried grapes of various kinds and well known in the market. The raisin industry has been long developed in the Old World, but has recently become an important industry in California.

Raleigh (*raw'lĭ*), the capital of North Carolina, named after Sir Walter Raleigh. It is situated on the Neuse river, a little less than 200 miles from Richmond. It is built on an elevated site, with a central Union Square, from which four principal streets radiate, each 100 feet wide. In the square stands the state capitol, a large granite building, costing over $500,000. The city also contains other state institutions and various manufactories. Population 13,643.

Ra'leigh, Sir Walter, was born at Hayes, Devonshire, England, in 1552. He entered Oriel college, Oxford, in 1566, but left in 1569, without taking a degree, to serve in the Huguenot cause in France. In 1580, he distinguished himself in the suppression of the Irish rebellion in Cork, and two or three years afterward was introduced to court and became a favorite of Queen Elizabeth. Raleigh's tall and handsome figure, his dark hair, lofty forehead, resolute bearing, alert expression, and spirited wit, combined to form an imposing personality, and all the advantages that nature had given him were heightened by a gorgeous splendor in dress and jewels. But as he was proud, haughty, and impatient, he made for himself a host of enemies, and was never fully admitted to the queen's counsels in reference to matters of state. The playful name of "Water," which she applied to him,

would indicate that she appreciated that instability of character which was his great fault, and which in the end worked his ruin. She, however, lavished numerous favors upon him throughout her reign, permitting him to send out and command various expeditions to the New World. His vessels scoured the seas in privateering enterprises, which at once gratified his inborn hatred of Spain and helped to provide the means for his various ventures in Virginia. Raleigh was in Ireland when the Invincible Armada appeared in English waters; but he hastened to the south of England to superintend the coast defense, and was present with the fleet throughout that week of toil and triumph. In June, 1596, he sailed in the expedition under Howard and Essex to Cadiz, and it was his counsels that governed the whole plan of action that for a second time shattered the naval power of Spain. Raleigh continued to enjoy the favor of Elizabeth until her death, in 1603; but James I. came to the throne with deep-seated prejudices against the gallant courtier, and in a short time stripped him of his various offices. Raleigh was also arrested and tried for taking part in a conspiracy against the king's life, the only witness against him being the miserable Lord Cobham, who made and unmade his eight different charges with such facility as to make them of no value at all. "But one thing," says Kingsley, "comes out of the infinite confusion and mystery of this dark Cobham plot, and that is Raleigh's innocence." He was, however, condemned to death, and only on the scaffold was his sentence commuted to imprisonment for life. After remaining in prison for thirteen years, Raleigh was released for the purpose of leading an expedition to the Orinoco river, in search of a gold mine, which he said existed there. He pledged himself not to come into collision with Spain; but some of his men, while he was sick aboard his ship, attacked a Spanish village and burned it to the ground. Raleigh returned to England without finding the mine, and was rearrested and executed under the sentence which had never been revoked. The speech he made on the scaffold was a masterpiece of eloquence. "As he stood there in the cold morning air," says Mr. Gosse, "he foiled James and Philip at one thrust, and conquered the esteem of all posterity." He asked to see the axe, and touching the edge, said: "This is a sharp medicine, but it is a sure cure for all diseases." He was executed at London, Oct. 29, 1618.

Ram, an ironclad ship, with a heavily-armored stem, projecting in the form of a beak below the water-line, intended to run into and sink an enemy's vessels. In action, the ram is propelled at full speed against her antagonist, and if she succeeds in striking her fairly, the blow is supposed to be sufficient to crush in her side and sink her immediately. The ram was first employed during the late Civil war in the action at Norfolk roads, in 1862, when the Federal frigate *Cumberland* was sunk by the Confederate ram *Virginia.*

Rama (*rä'mä*) is, in Hindu mythology, the name common to three incarnations of Vishnu, of Parasurama, Rama-chandra, and Balarama. See VISHNU.

Ramadan', the ninth month of the Mohammedan year. It was in this month that Mohammed received his first revelation, and every believer is therefore enjoined to keep a strict fast throughout its entire course from dawn to sunset. Eating, drinking, and all bodily pleasures are forbidden during the day, and even when obliged to take medicine the Moslem must make some amends for the privilege, such as spending a certain sum of money upon the poor; but during the night the most necessary wants may be supplied. The principal passages of the Koran relating to the fast of Ramadan are treated of in the second book, called *The Cow.*

Ramayana (*rä-mä'ya-na*) is the name of one of the two great epic poems of India, the name of the other being *Mahdbhdrata.* Its subject-matter is the history of Ráma, and its reputed author is Valmiki, who is said to have taught his poem to the two sons of Ráma. Although the statement is doubtful, it is certain that Valmiki was a real personage, and that the *Rámáyana* was not, like the *Mdhdbhdrata,* the creation of different minds at various epochs. As a poetical composition, the *Rámáyana* may safely be called the great poem of India.

Rameses (*răm'e-sēz*), the name of several Egyptian monarchs, of whom two, the first and the second, were especially famous. It is usual to identify the warrior-king Rameses II. with the Pharaoh who oppressed the children of Israel so sorely, and Rameses III. with the Pharaoh of the Exodus, although there is considerable difficulty in the identification. The mummy of Rameses II. was found in 1881, and that of Rameses III. in 1886.

Ramillies (*rā-mē-yē'*), a village of Brabant, Belgium, is memorable as the place near which, on May 23, 1706, the French forces under Villeroy and the elector of Bavaria, were defeated by Marlborough. This victory compelled the French to give up the whole of the Spanish Netherlands.

Ram'say, David, an American physician and historian, was born in Lancaster county, Pa., April 2, 1749, and, after graduating at Princeton college, studied medicine, and entered upon the practice of that profession at Charleston, S. C., two or three years before the Revolutionary war. After the capture of Charleston by the British, he was kept by them as a hostage at St. Augustine for nearly a year; and at the close of the war was chosen

a member of the Continental congress. Besides a number of medical essays and other works, he published a *History of South Carolina*, and a *History of the American Revolution*. Dr. Ramsay was a member of the South Carolina legislature for several years before his death, which took place at Charleston, S. C., May 8, 1815.

Ram'say, Nathaniel, a soldier of the Revolution, was born in Pennsylvania, May 1, 1771, and after graduating at Princeton college, was admitted to the bar and practiced law in Cecil county, Md. He entered the army early in the Revolutionary war, and was in command of a Maryland regiment at the battle of Monmouth, when General Lee's retreat seemed so likely to result in the rout of Washington's entire command; and when Washington arrived upon the field and proceeded to reform the troops, Ramsay rendered important service in holding the British in check, although at the loss of nearly all his command, a service for which he was highly commended and gratefully remembered by Washington. He died at Baltimore, Oct. 23, 1817.

Ramsey (*răm'zi*), **Alexander,** ex-United States senator, and ex-governor of Minnesota,

ALEXANDER RAMSEY.

was born near Harrisburg, Pa., Sept. 8, 1815, where, after studying law, he began to practice in 1839, and took part in the following year in the Harrison and Tyler campaign. In 1843, he was elected to congress in the Whig interest; from 1849 to 1853, he was governor of Minnesota territory, and again served Minnesota from 1859 to 1863, when it had become a state. He was at one time also mayor of St. Paul, and from 1863 to 1875 United States senator. In 1879, he became secretary of war in the Hayes administration. He has since acted as a member of the Utah and other commissions.

Ranch'ing, the business of cattle-raising in the unsettled regions of the west. The name is derived from the Spanish *rancho*, "mess," or "messroom." The special feature of ranching is that cattle are kept in a half-wild state, being allowed to range over a great deal of ground, such pasture as they can find being their only food. The life of ranchmen, or "cowboys," as they are generally called, is not as wild and free as it once was, but still has great charms for many different classes of young men.

Ran'dall, Samuel J., American statesman, was born at Philadelphia, Pa., Oct. 10, 1828, and after spending a number of years in mercantile business in his native city, was elected to congress as a Democrat in October, 1862. He held this position — being re-elected every two years — up to the time of his death, which took place at Washington, D. C., April 13, 1890. After the death of Speaker Kerr, in 1876, Randall was elected speaker of the house of representatives to fill the unexpired term. He was also chosen speaker of the house in 1877 and again in 1879. Throughout his congressional career, Mr. Randall's ability and integrity were conceded by men of all parties, and he was held in the highest esteem by his fellow-congressmen. He was a Democrat of the Protectionist stripe.

Ran'dolph, Edmund J., an American statesman, was born at Williamsburg, Va., Aug. 10, 1753, and after a course of legal study was admitted to the Virginia bar. In 1776, he helped to frame the constitution of Virginia, and became the first attorney-general of that state. He filled the office of governor of Virginia from 1786 to 1788, and was a member of the convention which framed the constitution of the United States. In 1789, he entered Washington's cabinet as attorney-general, and in 1794 was appointed secretary of state, to succeed Jefferson, which office he resigned in the following year on account of some misunderstanding with the President and his colleagues in reference to the Jay treaty. He died in Virginia, Sept. 13, 1813.

Ran'dolph, John, "of Roanoke," was born at Cawsons, Va., June 2, 1773. He was a second cousin of Edmund Randolph, and boasted the Indian Princess Pocahontas among his ancestors. In 1799, being only twenty-six years of age, he entered congress and continued a member of that body, with the exception of two terms, until 1825, when he was chosen United States senator, and occupied a seat in that body for two years, during which period he fought a duel with Henry Clay. In 1830, he was appointed minister to Russia, but returned home in the next year, and in 1832 was once more elected to congress. Before taking his seat, however, he died of consumption at Philadelphia, June 24, 1833, having provided in his will for the freedom of his slaves, some three hundred in number. During Randolph's long public career, he was distinguished alike for wit, eloquence, and eccentricity, and was more talked and written about than any public man of his time; many of his sallies and pungent utterances are still quoted in Virginia and throughout the country.

Ran'dolph, Peyton, was born in Virginia in the year 1723, and after studying law in the city of London, was appointed attorney-general of Virginia by the king in 1748. He was president of the continental congress when it first met at Philadelphia in 1774, but

resigned the position on account of his health. He again took his seat as a member of that body when it reassembled on the 10th of May, 1775, but died at Philadelphia, of apoplexy, in October following.

Rangoon', capital of Lower Burma, is situated on the Rangoon river, about 20 miles from its entrance into the gulf of Martaban. The present city is mostly of modern construction, having been built since the English took possession, in 1852. The town extends along the left bank of the river, the docks being opposite to it at the suburb of Da-la, on the other side of the river. A town has existed on the site of Rangoon since the 6th century B. C., but it was called Dagon till it was taken by the Burmese sovereign, Alombra, toward the end of the 18th century. That prince rebuilt the place, and called it Rangoon. The annual foreign trade of the city exceeds twelve million rupees. Population 190,000.

Ran'jit Singh, founder of the Sikh kingdom in the Punjab of India, was born Nov. 2, 1780, his father being a Singh chief, and the head of one of the twelve military organizations of the Singhs or Sikhs. When he was six years old, his father died; and at an early age he began to show both a desire and capacity to rule. After the Shah of Afghanistan had given him the province of Lahore, he directed all his energies to founding a kingdom which should unite all the Singh provinces under his personal rule. This object, after many severe conflicts, he accomplished, thus becoming the ruler of an extensive territory, with a well-trained army of 70,000 men. In 1836, his army was totally defeated by the Afghans, but this result did not affect his power over any of the territory he had acquired, and his long reign was not disturbed by a single revolt. He died June 27, 1839. He could neither read nor write, yet his signal ability and energy, united with a rare moderation, are without a parallel in Asiatic history.

Ranke (*räng'ke*), **Leopold von,** one of the greatest of German historians, was born at Wiehe, about half-way between Gotha and Halle, Dec. 21, 1795. Although he studied philology and theology at Berlin and Halle, his chief thoughts were directed to history, for the study and writing of which he possessed a rare genius. His historical works, nearly fifty in number, show remarkable skill in grouping events in proper order and placing them before the reader in a clear and vivid manner, so that he can readily see them in connection with all their causes and relations. Although Ranke was over ninety when he died, he could not have accomplished what he did, had he not been a man of such great industry and application, with a marvelous memory and excellent judgment as to the value of historical material. While his style is not brilliant, it is yet sufficiently clear and interesting. Perhaps the most popular of his works is his *History of the Popes*, so brilliantly reviewed by Macaulay, in the *Edinburgh Review* of September, 1840. Ranke continued to lecture in the University of Berlin until 1872, and died there fourteen years later, May 23, 1886.

Ran'som, Matthew Whitaker, United States senator from 1872 to 1895, and United States minister to Mexico (1895–97), was born in Warren county, N. C., Oct. 8, 1826, and educated at the University of North Carolina. In 1852, he was elected attorney-general of his state, and from 1858 to 1862 was a member of its legislature. In the Civil war, he ranged himself on the Southern side, and from lieutenant-colonel he rose to be major-general, and was one of those who surrendered at Appomattox. After this, he served for twenty-four years in the United States senate.

Raphael (*räf'ā-el*) or **Raffaello Santi** or **Sanzio,** called by his countrymen *Il Divino*, "the divine," is ranked by universal opinion among the greatest of painters. He was born at Urbino, Italy, March 28, 1483, and after the death of his father, who was his first instructor, he was placed under Perugino, the most distinguished painter of the period, who was then engaged on important works in the city of Perugia. In 1504, Raphael visited Florence, where he remained until 1508, and then went to Rome on the invitation of Pope Julius II. His celebrated frescoes in the Vatican and numerous important works were then commenced. The works of Raphael are generally divided into three classes: his first style, when under the influence of Perugino's manner; his second when he painted at Florence from 1504 to 1508; and his third style, shown in the works executed by him after he settled in Rome. Each of these styles has its peculiar features and devoted admirers. Those who incline to art employed in the service of religion prefer the first manner, as embodying purity and religious feeling. His last manner, perfected when the taste for classical art and learning was excited by the discovery of numerous works of the classic period, is held by many as correctly embodying the highest art; while his Florentine style is especially admired by some as showing his powers freed from the imitation of Perugino and as yet unaffected by the conventionalism of classic art. In each of these different styles, he has left works of great excellence. He died at Rome, April 6, 1520.

RAPHAEL SANZIO.

Rappahan'nock, a river of Virginia, rises in the Blue Ridge of the Alleghany mountains, and flows in a southeasterly course into Chesapeake bay — its total length being about 250 miles. The chief branch of the Rappahannock is the Rapidan; these two rivers were the scenes of several desperate battles during the Civil war, the most noted being Burnside's repulse at Fredericksburg, in the winter of 1862–63.

Raspberry (*rdz'bĕr-rĭ*), the name of certain species of *Rubus*, the bramble genus and a member of the rose family. Associated in the genus with raspberries are blackberries and dewberries. The original garden raspberries are *R. idæus*, a native of Europe, but it is now said to be almost out of cultivation in the United States. The parent of the black raspberries of the gardens is *R. occidentalis*, common to this country; while the parent of some of the red raspberries is *R. strigosus*, common in the United States, especially northward. Numerous garden varieties have been cultivated from these and other wild species, chiefly by hybridizing. Certain of the wild raspberries are exceedingly ornamental in cultivation, having large showy flowers, chief among which is *R. odoratus*, with purple flowers one to two inches in diameter.

Rat, a gnawing animal related to the mouse, and of similar form, but larger. Like mice, they are quick, burrowing, and nocturnal in their habits. The brown rat is about eight or nine inches long without the tail. It has spread over the civilized world, having originally come from western Asia. It appeared in Europe during the 18th century and has been transported by ships to other countries. It is commonly called the Norway rat, but the name is ill-advised, because Norway was not its original home. The black rat is smaller, being about six or seven inches long. Its original home is believed to have been Persia. It, likewise, by migration and transportation, spread around the world, but it is less fierce than the brown rat, and is driven before the latter.

Rat'tlesnake', a deadly poisonous snake, with horny rattles on the tail. The rattles are horny rings made of modified scales, so loosely constructed that they rattle when the tail is vibrated. There are about fifteen species, exclusively American. These snakes have grooved fangs that are erected when they strike. There are several reserve fangs on each side to replace those that may be broken. The common rattlesnake of the eastern United States extends from Maine to Texas. It attains a length of four feet, and, exceptionally, may have as many as twenty-three rings in the rattle. Their color is yellowish brown of various shades, with three rows of irregular brown blotches; the tail is black. They are naturally sluggish, and do not attack unprovoked. Their food is rabbits, rats, squirrels, and other small animals. The prairie rattlesnake, or massasauga, is smaller and darker colored. It is common in grassy meadows where not exterminated. Several other kinds are found west of the Mississippi and in South America.

Raubes (*row'bĕs*) **Haus** ("the Rough House") is the name of an institution founded and managed by Johann Heinrich Wichern, at Horn, near Hamburg, in connection with the German Home Mission. It is partly a refuge for neglected children; partly a boarding school for the moral and intellectual education of the children of the higher classes; and partly a training school for those who wish to become teachers or officials in houses of correction, etc. It was opened in 1831 by Wichern; and has since almost grown into a large community. The children live in families of twelve, each family being under the superintendency of an artisan, who employs the children in indoor and outdoor labor, according to their capability.

Ra'ven, a large crow-like bird, found in both the Old and New Worlds. The American raven is about two feet long, or even a little longer; the plumage is glossy black with a purple luster on some parts. It has a wide range but is local in its occurrence and rather rare. Its note is harsh, except during the breeding season, nevertheless, it can be taught to imitate sounds. It makes a rather bulky nest on cliffs or trees. The European bird has a shorter and deeper bill. They feed on rats and other small animals and, in some places, even attack lambs.

Raven'na, a city of central Italy, situated in the midst of a well-watered, fertile, and finely wooded plain. Ravenna is an ancient city, rich in monuments of art. Besides a library of nearly 100,000 volumes, it has an archæological museum and a number of educational institutions. The city was probably of Umbrian origin; at least it was an Umbrian city when it passed into the hands of the Romans. Augustus made it a first-class seaport and naval station, and 400 years later the Emperor Honorius took refuge there and made it the capital of the Roman empire. It attained its greatest glory under Theodoric the Ostrogoth, whose mausoleum is outside the walls. It contains the tomb of Galla Placidia, a Roman princess, who lived from 388 to 450 A. D., and was the daughter of Theodosius the Great. It became a republic in the early part of the 13th century, but was subject to Venice from 1440 to 1509, at which latter date it passed into the hands of the popes and continued under their dominion until 1860. Byron resided at Ravenna from June, 1819, to October, 1821. Population 68,065.

Raw'lins, John A., American soldier, was born at Galena, Ill., Feb. 13, 1831, and although his early educational opportunities

were very limited, he was admitted to the bar and commenced the practice of law at Galena in the year 1855, where he became acquainted with General Grant some years before the war. When the latter was appointed brigadier-general, in 1861, he offered Rawlins the position of assistant adjutant-general on his staff, which was at once accepted, and with scarcely any interruption he was with Grant in all his battles, marches, and campaigns, from Belmont to Lee's surrender at Appomattox Court House, rising from the rank of captain to that of major-general. When Grant became President, in 1869, he showed his gratitude for Rawlins' services by giving him a seat in the cabinet as secretary of war, a position in which he would no doubt have won additional honor and fame, but for his death, which took place at Washington, D. C., Sept. 9, 1869.

Raw'linson, George, brother of Henry Rawlinson, was born at Chadlington, Oxfordshire, in 1815, and after graduating at Oxford was elected a fellow and tutor in Exeter college. In 1860, he published his notable Bampton lectures on the *Historic Evidence for the Truth of the Christian Records.* His historical works cover nearly the entire history of the ancient Orient, commencing with an edition of Herodotus, in which many of his brother's discoveries are incorporated. This was followed by *The Five Great Monarchies of the Ancient Eastern World, The Sixth, and also the Seventh, Great Oriental Monarchy, A Manual of Ancient History, A History of Ancient Egypt,* and others.

Raw'linson, Sir **Henry,** K. C. B., Oriental scholar and diplomatist, was born at Chadlington, Oxfordshire, England, April 11, 1810, and was educated in Ealing, Middlesex. He entered the East India military service in 1827 and served in the Bombay presidency until 1833, when he was appointed to assist in reorganizing the army of the shah of Persia. During the six years he spent in that country, he began to study the cuneiform or wedge-shaped inscriptions, and made a translation of the famous Behistun inscription of Darius, which he published in the *Journal of the Asiatic Society.* After he left Persia he held command of Kandahar during the troublous times of 1840–42, and in 1844 was appointed political agent at Bagdad, and consul-general there in 1851. He then returned to England, but in 1858 was sent back to Persia as British minister. In 1871, he became president of the Royal Geographical society, an office which he retained till June, 1873, and in 1891 he was made a baronet. He died at London, March 5, 1895. He has written a number of books, among which are *England and Russia in the East, The Cuneiform Inscriptions of Western Asia, Outline History of Assyria,* etc.

Ray'leigh, Baron (**John Strutt**), one of the most eminent of English physicists, was born Nov. 12, 1842. He was educated at Trinity college, Cambridge, where he graduated senior wrangler and Smith prizeman in 1865. In 1879, he succeeded Clerk-Maxwell as professor of experimental physics at the University of Cambridge, a position from which he resigned in 1884, retiring to his country seat in Essex. Later he succeeded Tyndall as professor of physics at the Royal Institution in London. His profound scholarship is well illustrated by his *Theory of Sound,* 2 vols., which has remained a standard ever since its publication, nearly a quarter of a century ago. His prodigious activity is illustrated by the two large volumes of his *Scientific Papers,* published in 1901.

Raymond, Henry J., editor of the New York *Times,* and author of *The Life and Public Services of Abraham Lincoln,* was born at Lima, N. Y., Jan. 24, 1820, and graduated at the University of Vermont in 1840. After serving for a number of years on the staff of the New York *Tribune* and other papers, in 1851 he founded the New York *Times,* which speedily took rank among the leading journals of the country. Mr. Raymond was elected lieutenant-governor of New York in 1854, and was active in support of Fremont for President in 1856 and of Lincoln in 1860. In 1864, he was elected a member of congress from one of the districts of New York city, but declined a re-election two years later, preferring to devote himself to the duties of journalism; but in the month of June, 1869, he suffered an attack of apoplexy, which resulted in his death.

Ra'zor-shell, a long bivalve shell, shaped like a razor case, and belonging to the razor-clam. The shell gaps at each end, and from one the siphons or water tubes of the animal protrude. This animal makes vertical burrows in the sand, two or three feet deep, and ascends and descends by means of its foot. They are used both for food and bait.

Read, Opie, American novelist and journalist, was born at Nashville, Tenn., Dec. 22, 1852, and educated at Gallatin, Tenn. He began newspaper work first at Franklin, Ky., but proceeding west he made Little Rock, Ark., for about ten years his home, where he founded and edited a humorous weekly, *The Arkansaw Traveler.* He subsequently removed to his present home, in Chicago, where he has published a number of successful stories dealing with Southern life. His more important novels are *A Kentucky Colonel, A Tennessee Judge, An Arkansas Planter, Len Gansett, Emmet Bonlore, A Yankee from the West, The Wives of the Prophet, Old Ebenezer, The Jucklins, On the Suwanee River, Bolanyo,* and *My Young Master.*

Read, Thomas Buchanan, American poet and painter, was born in Chester county, Pa., March 12, 1822, and after spending a year or

two in the studio of a sculptor in Cincinnati, O., he gave his attention to painting, entering on the practice of that art in Boston at the age of twenty. In 1850, he went to Florence, Italy, where he continued to live, visiting America occasionally until his death, at New York, May 11, 1872. He won considerable fame as a portrait painter, and took an active interest in the cause of his native land during the great Civil war, his most popular poem, *Sheridan's Ride*, being written during that conflict, which he afterward illustrated. His *Wagoner of the Alleghanies* was written in 1862, and read publicly throughout the country by James E. Murdock for the benefit of the sanitary commission.

Reade, Charles, a distinguished English novelist, was born at Ipsden House, Oxfordshire, June 8, 1814. He received his education at Oxford, where he so distinguished himself as to secure a fellowship in 1835. It was not until 1850, however, that he commenced his career as a writer. "I studied," he himself tells us, "the great art of fiction for fifteen years before I presumed to write a line of it, writing first for the stage—about thirteen dramas, which nobody would play." Apart from his numerous quarrels and lawsuits, his life after 1852 is a record of the production of plays and novels, by the former of which he generally lost money, and by the latter secured both money and fame; for in spite of all his peculiarities and defects, he showed himself a story-teller of rare gifts and powers. Among his novels are *Griffith Gaunt*, *Hard Cash*, *Never Too Late to Mend*, *Put Yourself in His Place*, *The Cloister and the Hearth*, *Foul Play*, *A Terrible Temptation*, etc. He died at Shepherd's Bush, London, April 11, 1884, his last years being clouded by sorrow and ill-health.

Reading (*red'ing*), a city of Pennsylvania, on the left bank of the Schuylkill river, 60 miles from Philadelphia. It is pleasantly situated on an ascending plain, and draws its water supply from the neighboring hills. The principal manufactures of Reading are its iron and steel works, which include many rolling mills, forges, foundries, furnaces, etc. Many of the inhabitants are of German descent, and half the newspapers of the city are published in that language. Population 78,961.

Reaumur (*rā-ō-mür'*), **Rene Antoine Ferchault de,** a prominent man of science in France during the first half of the 18th century, was born in 1683, and died in 1757. He was educated by the Jesuits at Poitiers and at Paris; was elected a member of the Academy of Sciences at the age of twenty-four. To-day he is principally remembered as having devised the thermometric scale which goes by his name, namely, that in which the temperature interval between melting ice and boiling water is divided into 80 degrees. His other work relates mo ly to chemistry and natural history.

Recamier (*rā-kä-myā'*), Madame, *nee* **Jean Francoise Julie Adelaide Bernard,** was born at Lyons, Dec. 4, 1777. She grew up a girl of remarkable grace and beauty, and at the age of fifteen was married to M. Jacques Récamier, a rich banker of Paris, three times as old as herself, and immediately entered upon a career of social triumph almost without a parallel even in France. Her *salon* was soon filled with the brightest wits of the literary and political circles of the day, and, fortunately for herself, she was possessed of a temperament that saved her from temptation, and almost from scandal. She had a warm affection for Madame de Staël, and when the latter was banished by Napoleon, Madame Récamier did not fail to give the exile her warmest friendship and sympathy. In 1806, the ruin of her husband's fortune caused her to visit Mme. de Staël at Coppet, in Switzerland, and while there she met Prince August of Prussia, who is said to have been the only one of all her admirers that ever touched her heart. A marriage was arranged between them, provided a divorce could be secured. M. Récamier gave his consent to this; but his mild remonstrance so affected the wife that she declared she could not leave him in his adversity. When her devoted friend Châteaubriand became a widower, in 1848, he proposed marriage to her, her husband having died some years previously, but she declined the offer, although her friendship continued uninterrupted until his death, July 4, 1848. Madame Récamier died at Paris of cholera, a disease of which she always had a special dread, May 11, 1849.

Recep'tacle (in plants), that part of a stem axis upon which the floral organs are inserted. Usually the receptacle becomes much broader or more prominent in some way than the ordinary axis. "Torus" is an equivalent word. See FLOWER.

Reciprocity (*rē's'i-prŏs'i-tĭ*), an arrangement between two countries charging tariff duties against other countries, to admit such articles as may be agreed upon into each other's ports free from duty. When the present tariff law of the United States, known as the "McKinley bill," was passed in the year 1890, a provision giving the President discretionary power to enter into reciprocity treaties or arrangements with other nations, was made one of its leading features.

Red'breast, a bird belonging to the family of the Old World warblers. It is well known in the British Isles, and is called robin redbreast; but, it should be noted, that this is not the American robin, which is a thrush. It is about 5¾ inches long, olive-brown above, with the throat and upper breast a red-dish-orange. The abdomen is dull white. It occurs solitary or in pairs, and rears two or

three broods a season. Its song is sweet but plaintive.

Red Cross, The, is the badge and flag adopted by the societies of all nations organized for the care of the sick and wounded in time of war. The international conference, which assembled at Geneva, Oct. 26, 1863, and included among its members delegates from fourteen governments and six voluntary associations, may be taken as the starting-point of the Red Cross. At this conference, a proposed code of international enactments was discussed, and the main recommendations agreed to were: (1) The formation of a committee or society in each country to co-operate with the army sanitary service, in time of war, in the proper care of the sick and wounded, and in time of peace to occupy itself in preparing hospital stores, training nurses, etc.; (2) the declaration of the neutrality of hospitals, of the officials of the sanitary service, of the inhabitants of the country aiding the wounded, and even of the wounded themselves. The conference suggested the adoption of the same distinctive and uniform badge — the red cross on a white ground — for all hospitals and sanitary officials, as well as for the voluntary relief agents. A treaty embodying these recommendations was signed at a second conference in Geneva, in 1864, and has since been acceded to by nearly every civilized nation; and although other conferences have been held at Paris and Berlin, the resolutions passed at Geneva have undergone little change or modification.

Red Jacket, a chief of the Seneca Indians, was born near Seneca lake, N. Y., in 1752, his original name being Sagoyewatha, and the name of Red Jacket being given to him on account of a scarlet jacket presented to him by a British officer during the Revolutionary war. He was an active ally of the British in that contest; but in the War of 1812 he rendered valuable service to the United States in the operations on the Canadian frontier. During his last years, he lost much of his prestige and influence by his intemperate habits. He died on the Seneca reservation, near Buffalo, in 1830.

Red River, the lowest western branch of the Mississippi river, rises in the northern part of Texas, near the New Mexico border, and flows eastward as the boundary line between Texas and the Indian territory, thence southeast through Arkansas and Louisiana, entering the Mississippi, a little over 300 miles from its mouth. It receives its name of *red* from the color of the sediment with which it is loaded during high water. Its total length, on account of its winding course, is from 1,500 to 1,600 miles; and it receives numerous branches, the Washita, the Negro, and the Little Wichita, being the most important. It is navigable during seven or eight months of the year to Shreveport, La., 300 miles from its mouth.

Red River of the North rises in a cluster of lakes in western Minnesota, and flows northward, separating Minnesota from North Dakota, into British America, and emptying into Lake Winnipeg, about 600 miles from its source.

Red Sea or **Arabian Gulf,** is an inlet of the Indian ocean, stretching northwest from the strait of Bab-el-Mandeb (by which it communicates with the gulf of Aden) to the isthmus of Suez, by which it is separated from the Mediterranean. Its length is from 1,200 to 1,400 miles, its breadth varying from about 20 miles next the strait of Bab-el-Mandeb to about 200 miles in the central portion, the northern portion being divided by the Sinai peninsula into the gulf of Suez and the gulf of Akabah. The former of these gulfs is 180 miles in length by about 30 in breadth; the latter about 100 miles in length and from 10 to 15 miles in breadth. From the earliest times the Red Sea has been a great highway of commerce between India and the countries bordering on the Mediterranean, being traversed successively by Egyptians, Phœnicians, Hebrews, and Arabs. It is first mentioned in the book of Exodus on the occasion of the passage of the Israelites, which is supposed to have taken place a little south of the present town of Suez. The discovery of the route around the Cape of Good Hope turned the traffic with India into a different channel; but since the opening of the Suez canal, in 1870, the Red Sea has more than regained its former importance as the highway of commerce between Europe and the east.

Red'start, the name given to a small bird common in the United States, and, also, to a similar bird common in Europe, but belonging to a different family. The American redstart belongs to the family of New World warblers. It is nearly five and one-half inches long, with a black plumage and orange-red blotches or bands on the wings, the base of the tail, and sides of the breast. The abdomen is white. This bird perches on trees, from which it is continually flitting to catch insects on the wing. It is very abundant. The European redstart belongs to the family of Old World warblers. It is slightly smaller than the American bird, being about five and one-quarter inches long. It is dark-gray, with black throat, white forehead, and the breast, sides, and tail a rusty-red. In some parts of England it is called the fire-tail.

Reed, in music, the mouthpiece of a hautboy, bassoon, or clarionet. Also a piece of metal with a brass spring or tongue attached to it in such a way that the admission of a current of wind causes it to vibrate and produce a musical note. The reed is of two kinds, the *beating* reed, and the *free* reed. The former is used in the pipes of an organ,

and must be placed within a tube to produce a musical sound. The invention of the free reed has been ascribed to M. Grenié, a Frenchman, who brought it into use, but it has long been known to the Chinese. Its note is smoother and more mellow than that of the beating reed, and it has the advantage of not requiring a pipe, which is a necessary appendage to the latter.

Reed, Thomas B., an American Republican politician, was born at Portland, Me., Oct. 18, 1839, and graduated from Bowdoin college in 1860. After serving a short time as assistant paymaster in the navy, he studied law, and commenced legal practice in 1865. After serving successively as a member of the Maine legislature, as attorney-general of the state, and as city solicitor of Portland, he was elected a representative in the 45th congress in 1876. His commanding ability was so clearly recognized that he soon became the acknowledged leader of the Republican party on the floor; and when his party secured a majority of the house of representatives in the 51st congress, Mr. Reed was chosen speaker.

THOMAS B. REED.

He served continually in Congress until 1899, and was elected speaker of the 54th and 55th Congress. He was re-elected in 1899, but resigned his seat and took up the practice of law in New York City. He published *Reed's Rules* in 1894, and edited *Modern Eloquence* (10 vols.) 1901.

Reeves, John Sims, one of England's greatest singers, was born at Shooter's Hill, Kent, Oct. 21, 1822. At fourteen, he was counted a clever performer on various instruments, and was appointed organist and director of the choir in the church of North Cray, in Kent. He went to Paris, in 1843, in order to perfect his voice and style, and on his return to England, in 1847, he was recognized as the first tenor in that country, a position which he maintained for a number of years, his voice being one of wide range, and of great natural sweetness and purity. He died at Worthing, Sussex, Oct. 25, 1900.

Reforma'tion, the name given to the great religious revolution of the 16th century. With the reformation began what is known as *Modern Europe*, while the epoch that preceded it bears the equally distinctive name of *Middle Ages*. From the year 800, when Charlemagne was crowned emperor of the Romans by Pope Leo III., western Europe had been under complete subjection to the church, and many abuses had arisen. The revival of learning and the discovery of the New World had also awakened a spirit of independence in men's minds, so that it only required a spark to kindle the slumbering agitation into a definite flame, and this was supplied by the sale of indulgences under Pope Leo X. Once started, the Reformation made such rapid progress that the national churches of Britain, of Sweden, of Norway, of Holland, and of many parts of Germany and Switzerland, were separated from Rome, while in other countries, such as Hungary and France, the same movement detached large portions of the people from the Catholic faith, without separating the church itself from the papacy. By the middle of the 16th century, it seemed as if the revolution would carry everything before it. At the beginning of the Reformation, the authorities of the Catholic church did not realize the extent of the danger which threatened it, regarding the movement merely one of the many discussions and schisms to which the church had always been more or less subject; but when they saw the revolt spreading into country after country, and taking such a firm hold on the minds of both rulers and people, their eyes were opened, and they proceeded to the repair of the breaches that had been made with all the zeal and energy of which they were capable. The Society of Jesus, founded by Ignatius Loyola, in 1540, supplied an army of enthusiasts whose policy and devotion saved Rome from dissolution. By the decrees of the council of Trent the church reaffirmed its ancient doctrines and traditions; and a succession of popes during the latter half of the 16th century, carried out with zeal the policy marked out for them by the Jesuits. To quote the language of Lord Macaulay: "Two reformations were pushed on at once with equal energy and effect — a reformation of doctrine in the north, and a reformation of manners and discipline in the south. . . . In the order of Jesus was concentrated the quintessence of the Catholic spirit; and the history of the order of Jesus is the history of the great Catholic reaction." Thus the middle of the 16th century saw the tide of the revolution checked; and by the close of the same century Europe was divided between the two religions by almost the same lines as exist at the present day. To quote again from Macaulay: "As Protestantism had driven Catholicism to the Alps and Pyrenees, so Catholicism rallied and drove back Protestantism, even to the German ocean; nor has Protestantism in the course of 200 years been able to reconquer any portion of what was then lost." See Seebohm's *Era of the Protestant Revolution.*

Regillus (*re-jil'us*), anciently a lake in Latium, to the southeast of Rome, probably in the extinct volcanic crater of Corunfelle, which was drained in the 17th century. It is

celebrated in the semi-legendary history of Rome as the scene of a great battle in the year 496 B. C., between the Romans and the Latins, in which the Latins were totally defeated.

Regnault (*re-nō'*), **Henri Victor,** a French chemist and physicist distinguished especially for his accurate measurements of a large number of physical constants. He was born July 21, 1811, at Aix-la-Chapelle, and died at Paris, Jan. 19, 1878. He was educated at the Polytechnic school and at the School of Mines in Paris. After a few years spent in teaching chemistry at Lyons, he was called (1840) to the Polytechnic school as professor of chemistry, a position which he resigned a year later to accept the chair of physics at the Collège de France. It was here that he carried on his magnificent series of determinations of specific heat of various elements and compounds, and of the coefficient of expansion of various gases and liquids.

In 1854, he was appointed to the directorship of the national porcelain factory at Sèvres. The destruction of his laboratory by German shells, the loss of his son (already a distinguished painter) in battle, in 1871, and the outcome of the Franco-Prussian war combined against him, and left him a broken-hearted man for the remaining seven years of his life.

Regulus (*reg'ū-lus*), **Marcus Atilius,** a distinguished Roman, who was consul for the first time in 267 B. C. Chosen consul a second time, in 256 B. C., he was sent in connection with his colleague, Manlius, at the head of a navy of 330 ships, against the Carthaginians, whom he totally defeated off Heraclea Minor. The Romans then landed at Clypea, and for some time Regulus was victorious in every encounter, but at last suffered defeat and was taken prisoner. He was kept in captivity for a number of years, but when fresh reverses caused the Carthaginians to sue for peace they sent Regulus to Rome, on parole, in company with their own envoys. It is related that when Regulus came before the Roman senate he urged that body to reject all the proposals of the Carthaginians, even to an exchange of prisoners, but to prosecute the war against that country with the utmost vigor until it was utterly subdued. After persuading the senate to adopt this course, Regulus refused to break his parole, and, without even waiting to see his family, returned to Carthage, where he was put to death (? 250 B. C.) with the most terrible torture.

Reichs'an'stalt, the great national physical laboratory of Germany, established in 1888, and situated at Charlottenburg, a suburb of Berlin. The object of this institution is twofold; its first aim being to carry out investigation of a purely scientific character, such problems, for instance, as the change of density in water which accompanies a change of temperature, the laws of radiation, etc., while its second aim is to act as a standardizing bureau, to which makers can send thermometers, resistance coils, standard cells, etc., to be tested and certified. The two functions are performed in different buildings. The first president of the Reichsanstalt, and the controlling spirit in its establishment, was Von Helmholtz, who conducted the affairs of the institution from 1888 until his death in 1894. The present (1901) director is Professor F. Kohlrausch, who succeeded Helmholtz in 1894.

Reid, Captain **Mayne,** British novelist and writer of boys' stories, was born in County Down, Ireland, in 1818, and at twenty years of age emigrated to America, where he led a roving and adventurous life, serving in the United States army during the Mexican war. He then went to Europe, intending to take part in the Hungarian struggle, but as it was concluded before he reached that country, he settled down to a literary life in England. His vigorous style and the profusion of hair-breadth escapes he furnished, delighted his breathless readers, who did not stop to notice the truthfulness of his scenery or the occasional excellence of his narrative style. He died at London, Oct. 22, 1883. See *Memoir*, by his widow.

Reid, Thomas, an eminent Scottish philosopher, was born April 26, 1710, at Strachan, a country parish in Kincardineshire, where his father was minister. He took his degree of M.A. at Aberdeen college in 1726, and continued to act as librarian there for a number of years. In 1737, he was appointed minister to the parish church of New Machar, in which position he labored with zeal and success until 1752, when he was appointed one of the professors of philosophy in King's college, Aberdeen. In 1763, he was chosen to succeed Adam Smith as professor of moral philosophy in the University of Glasgow, and henceforth devoted himself to mental and metaphysical speculation. In 1764, he published his *Inquiry into the Human Mind;* in 1785, his *Philosophy of the Intellectual Powers;* and in 1788, his *Active Powers of the Human Mind.* These treatises must always be looked upon as constituting the first complete and systematic work on the constitution of the human mind. He died at Glasgow, Scotland, Oct. 7, 1796. See his *Life*, by Dugald Stewart, and McCosh's *Scottish Philosophy.*

Reid, Whitelaw, editor of the New York *Tribune*, was born near Xenia, O., Oct. 27, 1837, and graduated at Miami university, Oxford, O., in 1856, soon after which he commenced his literary and journalistic career by becoming editor and proprietor of the Xenia *News.* When the Civil war broke out, Mr. Reid accepted a position on the staff of the Cincinnati *Gazette*, and as its war correspondent won a national reputation by his remarkable clearness of description and accuracy of statement. In 1868, Mr. Reid severed

his connection with the Cincinnati *Gazette* to accept a position on the staff of the New York *Tribune*, then edited by the famous Horace Greeley; and when Mr. Greeley resigned the editorship of the paper, in 1872, Mr. Reid was chosen to fill his place. This position Mr. Reid still holds, having also become principal proprietor, and advanced the paper to the plane of highest prosperity. When Benjamin Harrison became president, in 1889, Mr. Reid was appointed United States minister to France, and during the two years he held that office, discharged its functions in such a manner as to reflect high honor upon himself. At the Republican national convention which met at Minneapolis, Minn., in June, 1892, Mr. Reid was placed in nomination for Vice-president, but was defeated at the election held in the following November. In 1897, he was special ambassador of the United States to England on the occasion of the jubilee of the late Queen Victoria.

Rein'deer or **Car'ibou,** a kind of deer found in the northern parts of Europe, Asia, and America. It can be distinguished from all its allies by the fact that both sexes have antlers. These are very large in comparison with the size of the animal, which is heavily built, with short limbs. The antlers have a browtine extending forward. In the American form the browtine of one side is aborted and the other is largely developed. The antlers, as well as the hoofs, are used in removing snow from their food, which, in the winter, is a sort of lichen called reindeer-moss. These animals have long been domesticated in Scandinavia and Lapland. They yield good milk, and supply material for clothing, and in the cold countries fill the place of horse, cow, goat, and sheep. They are able to draw about three hundred pounds, over the frozen snow, at the rate of nine or ten miles an hour. The United States government maintain at present (1901), stations in Alaska to promote the propagation of the reindeer and to instruct the natives in their care and breeding.

REINDEER.

Rembrandt (*rem'brant*), **Hermanzoon,** commonly called "Rembrandt van Rhyn," was born at Leyden, July 15, 1607. After attending the Latin school at Leyden and studying art under Peter Lastman at Amsterdam and Jacob Pinas at Haarlem, he returned home, and devoted himself to the study of nature. About the year 1630 he was encouraged to establish himself at Amsterdam, where he soon entered on a most successful career, and executed numerous works, including those wondrous etchings, between three and four hundred in number, which have done almost as much as his paintings to give him so high and extended a reputation. Rembrandt's power and originality are exemplified in almost every branch of art, and as examples of composition, expression, color, light, and shade, his works rank with those of the greatest artists. He died at Amsterdam, Oct. 8, 1669.

REMBRANDT VAN RHYN.

Remen'yi, Edouard, a distinguished Hungarian violinist, was born in 1830 at Heves, Hungary. Being obliged to flee from his native land because he took part in the revolution of 1848, he came to America, but returned to Europe shortly after, and earned great fame by his skill as a performer on the violin.

Rem'ington, Frederick, American artist, illustrator, sculptor, and author, was born in St. Lawrence county, N. Y., Oct. 4, 1861. He early studied at Yale Art school, and at the Art Students' league of New York, after which he led the life of a cowboy and stockman on a ranch in Montana and Wyoming, where he became notable as an animal painter and illustrator of Western scenes and modes of life on the plains. He subsequently came into note as an illustrator for magazines, treating of military subjects and of ranching life, and after the Spanish-American war of Cuban scenes and characteristics. His chief canvases and best known paintings are *A Dash for the Timber*, *The Last Stand*, *Past all Surgery*, *The Last Lull in the Fight*, and *Conjuring the Buffalo Back*. Among his leading works in sculpture are *The Broncho Buster* and *The Wounded Bunkie*. He is the author of the following works: *Pony Tracks*, *Crooked Trails*, and *Frontier Sketches*.

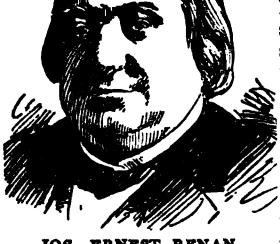
Remora (*rĕm'ō-ra*), a sucking fish with an oval suctional disc on the upper surface of the head. By means of the sucker they attach themselves to sharks, turtles, and even ships. They are found in warm seas and along the Atlantic coast north to New York. They are commonly exhibited in salt water aquaria.

Rem'sen, Ira, distinguished American chemist and educator, and successor to Dr. D. C. Gilman as president of Johns Hopkins

university, was born at New York, Feb. 10, 1846. After graduating in 1865 from the college of the city of New York, and in 1867 from the College of Physicians and Surgeons, he attended the universities of Munich and Göttingen and was for a time (1870–72) assistant in chemistry at Tübingen. On his return to the United States, he was professor of chemistry at Williams college, and in 1876 accepted the same post at Johns Hopkins. Besides his educational and administrative work and his researches in chemistry he has written a number of treatises on this his special topic, both on theoretical and on organic chemistry. On the resignation by Dr. Gilman, of the presidency of Johns Hopkins, Dr. Remsen was prevailed upon to accept this responsible executive office, in addition to his own lectureship, and to pursuing his own special lines of scientific work.

Remusat (*rā-mü-sa'*), **Charles Francois,** a French politician and philosopher, was born at Paris, March 14, 1797, and studied with brilliant success at the Lycée Napoleon. He made his first appearance in politics as a journalist in 1818, allying himself closely with Guizot, but subsequently withdrew from this connection, becoming more independent, although he was always prudent and temperate in his views. On the establishment of the *Globe*, in 1824, Remusat became one of its contributors. He was exiled after the *coup d'état* of Napoleon III., in 1851, but afterward received permission to return to France. He devoted himself to literary and scientific pursuits till 1871, when President Thiers called him to the portfolio of foreign affairs, a position which he held until 1873. He died at Paris, June 6, 1875. See translations of his mother's *Memoires*.

Renan (*rā-non'*), **J. Ernest,** one of the most eminent authors of the 19th century, was born at Tréguier, France, Feb. 27, 1823. He remained in his native village, a pupil in its school, until his sixteenth year, after which he was taken by the Abbé Dupanloup to his seminary at Paris, to be educated for the Catholic priesthood. After a three years' course at this seminary, he was entered as a student at St. Sulpice, the great seminary of the diocese of Paris. At St. Sulpice his attention was mainly turned to the study of Hebrew, and to this study, of his own accord, he added that of German. The result of these studies was to destroy his faith in the supernatural or miraculous element in Christianity, and he therefore abandoned all idea of the priesthood and resolved to devote himself to literature. In 1860, Renan was appointed by Louis Napoleon a member of the commission to study the remains of Phœnician civilization. While absent on this mission, he visited Syria and Palestine and obtained acquaintance with the latter country, which enabled him to give such a vivid local coloring to his *Life of Jesus*, published two or three years after his return. In 1861, he was chosen professor of Hebrew at the Collège de France, in Paris, but on account of his religious views was not fully established in that position until after the fall of the empire in 1870. Renan's published works are quite numerous, but the one by which he is most widely known is his *Life of Jesus*, which has been translated into the languages of all civilized nations. Renan died at Paris, Oct. 2, 1892.



JOS. ERNEST RENAN.

Reproduc'tion (in plants). In addition to the work of nutrition the plant must organize for reproduction. Two general types of reproduction are recognized. The first is vegetative multiplication, in which no such specialized bodies as spores are formed, but the ordinary vegetative body is used for this purpose. Among the lowest plants vegetative multiplication takes place by means of ordinary cell-division, and is the only method of reproduction used. In the more complex plants, various outgrowths or portions of the body, as gemmæ, bulbs, buds, tubers, various modifications of branches, etc., furnish means of propagation. The second kind of reproduction is by means of spores. Spores are specially organized to reproduce, and are not at all concerned in the nutritive work of the plant. There are two general types of spores, which differ from one another not in their power, but in the method of their origin. The "asexual spore" is ordinarily produced by cell-division; the "sexual spore" is produced by the union of two sexual cells known as "gametes." The general name of the sexually formed spore among plants is "oospore," or frequently "fertilized egg." The process by which spores form new plants is known as "germination." See SPORES.

Reptiles (*rĕp'tilz*), a class of vertebrates, embracing four natural orders of living forms as follows: I. *Chelonia*, the tortoises and turtles; II. *Lacertilia*, the lizards; III. *Ophidia*, the snakes and serpents; IV. *Crocodilia*, the crocodiles, alligators, etc. The Hatteria, of New Zealand, is related to the lizards, but stands in a group by itself. In the evolution of life the reptiles were the forms that first became independent of the water, and began to live entirely on land. Reptiles and birds, although so different in form and habits, are united by many peculiarities of structure. Huxley proposed for them a common name (*Sauropsida*) uniting the two classes. In addition to the living forms, there are many extinct forms of this class

which extend the classification, and also show best the resemblances between birds and reptiles. The plesiosaurs were enormous water animals with extremely long necks. Fossils are found indicating their length to have been about forty feet. The ichthyosaurs were long water animals, attaining thirty or forty feet in length. The dinosaurs show many bird-like peculiarities. They lacked the power of flight and lived both on land and in the water. Some forms reached a length of sixty feet. The pterodactyls were flying reptiles with membranous wings, which in some cases had an expanse of twenty-five feet.

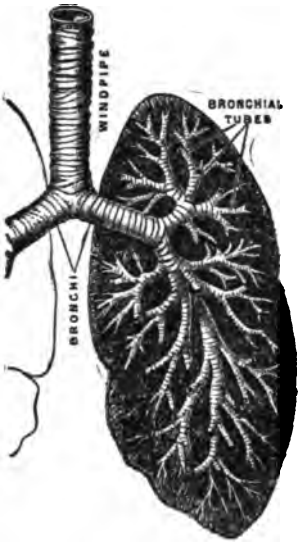
Repub'lic, Grand Army of the. The Grand Army of the Republic is an organization composed of those who were soldiers and sailors in the Federal army and navy during the Civil war — the men in blue who upheld the flag and saved the Union. Its object is to preserve the spirit of comradeship among those who stood side by side amid the hardships and perils of war; to care for sick and disabled soldiers; to provide for the widows and orphans of those who fell in field or hospital, or who have since died; to stand by each other while living, and to bury those who answer the final call as the years go by. The organization was first suggested and planned by Dr. B. F. Stephenson of Springfield, Ill. The first post was organized early in 1866, and on July 12th of that year a meeting of representative soldiers from all parts of the state was held at Springfield, where they were mustered in and given authority to organize posts throughout the state. The organization grew rapidly and extended to other states. The posts in each state constitute a department, and the organization has now reached a total of 6,905 posts, with a membership of 287,981. The motto of the order is, Fraternity, Charity, and Loyalty. The badge of the Grand Army consists of an eagle and a star, connected by a ribbon representing the flag. A bronze button is also worn as an every-day insignia of the order. The order is strictly non-political, and none but honorably discharged soldiers can become members. There are frequent campfires, reunions, and banquets, and once each year a grand national encampment is held. At these meetings greetings are exchanged, memories are revived, the old songs of the war are sung again, and the unwritten history of the war is recalled. Under the auspices of the order, large sums are every year expended in charity. Hundreds of soldiers' and sailors' monuments have been erected, orphans' homes have been built and endowed in many states, and a helping hand has been given to thousands of old soldiers, and soldiers' widows and orphans.

Res'ins, a class of natural vegetable products, closely allied to the essential oils, and in most cases obtained from the plants which yield them mixed with oil. Resins are divided into hard resins, soft resins, and gum resins. The hard resins are solid and brittle and contain little or no oil, such as copal, lac, mastic, jalap, etc. The soft resins can be molded by the hand, and some of them are sticky and semi-fluid, in which case they are called balsams. They are the solutions of hard resins in essential oils, or admixtures of the two. Turpentine, storax, and the balsams of Tolu, Peru, and Canada are examples. The gum resins are the milky juices of certain plants made solid by exposure to the air. Resins are widely diffused throughout the vegetable kingdom and are much used in medicine and in the mechanic arts. They are generally obtained by making incisions in the wood from which they are obtained, although it is sometimes necessary to use boiling alcohol to extract them from the wood. The common resin, or rosin, of commerce, exudes from several species of pine, and is used in the preparation of ointments and plasters and for various other purposes.

Resonance (*rĕz'ō-nans*), a term used in physics to denote the process by which one body sets in vibration another body having the same period of vibration. When one attempts to ring a large church bell, he soon learns that he must pull the rope at certain definite intervals if he wishes to ring the bell with ease. A rowboat moored in quiet water can, without difficulty, be set rocking if one throw his weight, first on one side then on the other, at correct intervals. If two pendulums of the same period be mounted upon one common frame, and then one pendulum be set in vibration while the second one is at rest, it will be observed that the second pendulum soon "picks up" a vibration of considerable amplitude from the first pendulum. These are all instances of resonance, taken from mechanics. In acoustics and electricity, there are also many illustrations. A tuning fork held over a tall jar partially filled with water will have its sound very much reinforced when the column of air in the jar above the water is capable of vibrating in the same period as the tuning fork. The sounding box of the guitar and violin are in resonance with the strings and enable them to give out energy at a more rapid rate. Electrical resonance is frequently employed in wireless telegraphy. For a complete theory of resonance, see Donkin's *Acoustics* (Oxford, 1884).

Respira'tion, Organs of. The respiratory organs are of two kinds, gills and lungs. The former are adapted for respiration in water, the latter for action in free air. Gills are found in clams, crayfish, squids, and other invertebrates, as well as in all fishes. The essence of respiration consists in an exchange of oxygen and carbon dioxide (CO_2) between the blood and the air. Special organs of respiration are not necessary to accomplish this end. The earthworm, for example, breathes

through the skin, that is, the blood comes close to the surface in thin-walled vessels, and the exchange between it,and the air is accomplished. In the simplest animals, like the amœba, where there is no blood, the breathing is done by the protoplasm of the body, but the exchange of carbon dioxide for oxygen is essentially the same as in higher animals. It must also be understood that respiration in plants is of the same nature as in animals. The old statement, that plants breathe carbon dioxide(carbonic acid gas) in the sunlight, giving off oxygen, and, in darkness, reverse the process is not true. In breathing they take in oxygen and give up carbon dioxide at all times, and the process is more active in sunlight than in darkness. It is easy to point out how the erroneous idea in reference to their breathing arose. Plants use carbon dioxide in their process of nourishment, and they return free oxygen to the air as a left-over product. This comes mainly from the process of starch formation, and, as that process takes place in the sunlight, it was at first supposed that the oxygen was set free in daylight from the process of respiration.



WINDPIPE, BRONCHI, AND ONE LUNG.

Fishes possess gills throughout life; the amphibia have them in larval stages, and, in some forms, both gills and lungs exist in the same individual. Lungs make their first appearance in the dipnoi fishes (which see) and occur in all animals of a higher grade. Lungs are developed in all animals as sac-like expansions of the walls of the pharynx, blood vessels are spread over them, and air is introduced into the inside. In the human body the lungs become very complicated. The windpipe divides into two main branches — the bronchi. These enter the lungs, and are sub-divided again and again into the bronchial tubes, which branch like the twigs of a tree. The smallest divisions enter into air-sacs, which are lobulated and have very thin walls. A network of capillaries is spread over the thin walls of the air-sacs, and it is in these capillaries that the exchanges between air and blood go on. The blood does not anywhere come into actual contact with the air, but the exchange of gases is made (by osmosis), through the thin membranes of the air-sacs and the capillaries. The substance of the lungs is spongy, and considerable elastic tissue enters into their structure, which allows them to expand and contract. It is not possible in an illustration to give a true picture of the complexity of the lungs. Not only do bronchial tubes branch through their substance, but blood vessels which carry blood to be aërated, others which carry arterial blood to nourish the lungs, besides lymphatics and nerves. The oxygen received by the lungs is carried to the minutest parts of the tissues, and is there given up in exchange for carbon dioxide. It is therefore clear, that there is an *external* respiration taking place in the lungs, and an *internal* respiration taking place in the tissues throughout the body. The latter is the more important part of the process of respiration. The air is renewed in the lungs through the action of the diaphragm and other muscles. For the amount of air breathed and other details, see Huxley's *Lessons in Elementary Physiology* (new edition, 1900), or any other good textbook of physiology.

Respira'tion (in plants), the process by which most plants set free in their bodies the energy required for doing the work necessary to maintain life and to form new parts. It is essentially identical with the respiration of animals. It consists of several separate but related processes: (1) the absorption of oxygen and its union with the protoplasm or with foods by the action of the protoplasm; (2) the decomposition of this unstable substance, resulting finally in the formation of carbon dioxide and water; (3) ridding the body of these waste products. The oxygen is absorbed directly from the water or air by smaller plants, but in the larger it is distributed to the internal tissues by a system of air passages (see AËRATION). Through a reverse process the carbon dioxide is got rid of. The chemical details of respiration are not known. It is even uncertain whether it is the living protoplasm or the foods that are oxidized. Neither is it known how the energy is used, nor in what form it is set free. Some of it appears as heat, making the body warmer than the surrounding air. But this heat is so quickly lost that it can only be observed when its dissipation is hindered. In this the plant is like a cold-blooded animal. On account of the carbon dioxide excreted, the plant loses weight, unless supplied with food; thus, if a seed germinate in darkness, after a few weeks the plantlet may have less than half the dry weight of the seed from which it grew.

Retort', a vessel employed by chemists for the purpose of distilling or effecting decomposition by means of heat. It may be made of glass, of earthenware, or metal, according to the purpose for which it is to be used. Glass

retorts are the most common, but in cases requiring a higher degree of heat than glass can bear, earthen retorts are used, and iron retorts are necessary in the laboratory for many processes.

Reuter (*roi'ter*), **Fritz,** a novelist and poet who wrote in the Low-German dialect, was born at Mecklenburg-Schwerin, Nov. 7, 1810. While studying law at Jena in 1833, he became involved in some of the revolutionary schemes of the students' association, and was arrested and sentenced to thirty years' imprisonment. He was released after seven years' confinement in various Prussian fortresses; and a few years later began to write the books which spread his name throughout all Germany. His tales have the flavor of real life, and prove their author a born story-teller. He died at Eisenach in Thuringia, July 12, 1874. See M'Callum's *Studies in Low-German Literature.*

Revere', Paul, a Revolutionary soldier, famous for his midnight ride from Boston to Lexington, to warn the militia of the approach of the British soldiers, was born at Boston, Jan. 1, 1735. Revere was one of the party that destroyed the tea in Boston harbor, and was at the head of a volunteer committee to watch the British. When it was known that the latter intended to move to Concord, Revere crossed over to Charlestown, and on the night of April 18, 1775, rode to Lexington, rousing the minute-men on his way. He was stopped at Lexington, but a companion succeeded in reaching Concord. Revere rose to the rank of lieutenant-colonel of artillery during the war, and after independence was secured established the Revere Copper company at Canton, Mass. He died May 10, 1818. His ride has been made the subject of a fine poem by Longfellow.

Revolv'er, a small fire arm, an improved form of pistol, which by means of a revolving breech or revolving barrels, can be made to discharge more than once without reloading. The invention is far from being new, specimens being still in existence which were manufactured during the 17th century; but in 1835, Colonel Samuel Colt patented "Colt's revolver," which was a great advance on all previous experiments, and is substantially still in use. It consists of one rifled barrel and a revolving cylinder with six or seven chambers, which are successively brought into line with the barrel by the action of the trigger. Each chamber has its nipple for a cap, which is brought under the hammer by the motion which brings the chambers around to the barrel. In addition to this, by withdrawing a bolt the breech-piece may be taken out and replaced by another of the same kind with chambers ready loaded. Revolving firearms of larger size are used in wars, the best known of which is the French *mitrailleuse*, of which so much was heard during the Franco-Prussian war of 1870.

Rey'nard the Fox, is the title of a celebrated fable of the middle ages, being the last of a series of poems in which wild beasts are the speakers and actors. It was written in Low German, professedly by one Hinrik van Alkmer in 1498; but most German critics say the real author is one Hermann Barkhausen, who published his book under a pseudonym.

An outline of the story may be briefly given as follows: When Nobel the lion, king of beasts, was holding his court one eastertide, all the animals, great and small, came to him and paid him homage, except Reynard the fox; and for his various misdeeds Reynard was summoned to appear before the Lion, Bruin the bear being sent to summon him. Reynard, however, told the bear of some honey hid in a split tree, in which Bruin got himself fast and nearly beaten to death by some peasants before he got back to court. Tibert the cat was the next messenger; but Reynard persuaded him to go and catch some mice in a place where there was a noose, in which the cat was caught and suffered a beating before he got away. At last, Grimbart the badger went to summon Reynard and persuaded him to appear at court, where he was tried and condemned to death. But just before he was to be hung on the gallows he asked leave to make a speech, in the course of which he told the Lion that old Reynard his father, in connection with Isengrim the wolf, and Bruin the bear, had formed a conspiracy to kill the Lion and make Bruin king in his place; but he (Reynard) had stolen their treasure and hidden it, as he could not bear to see the noble Lion killed and the wicked Bear made king in his place. After hearing this story, the Lion pardoned Reynard and put the Wolf and the Bear in prison. But when the Lion asked Reynard to show him where the treasure was he excused himself because he was under an oath to make a pilgrimage to Rome. The Lion then let him go; and Reynard immediately set out on his pilgrimage, taking with him Cuwært the hare and Belin the ram. On his way he passed his own house, and induced Cuwært to go with him, and there killed him. And putting the Hare's head in a satchel, he gave it to the Ram, telling him to carry it back to the Lion, as it contained valuable letters. When the Lion saw the Hare's head he was very angry, and at once released the Wolf and Bear from prison, and declared the Fox an outlaw. Another version of the fable adds an account of a fight between the Wolf and the Fox, in which the latter by his trickery won the victory, and finally returned to his own home, honored with the favor and protection of the Lion.

Reyn'olds, John Fulton, an American soldier and major-general of volunteers, was born at Lancaster, Pa., Sept. 20, 1820, and killed at the battle of Gettysburg, July 1, 1863. He graduated at West Point in 1841

and got a lieutenancy in 1846, after which he served in the Mexican war, was engaged against the Rogue River Indians, in the Utah expedition and in 1859 became commandant of West Point. In 1861, he was appointed brigadier-general of volunteers and took part in the campaigns of the army of the Potomac. After serving with distinction in the Peninsular campaign and saving the Union army at the second battle of Bull Run from a disastrous rout, he gained the rank of major-general and succeeded Hooker in the command of the First Army Corps. On the first day of the battle at Gettysburg he was struck by a rifle ball, which unhappily ended his promising career.

Reyn'olds, Sir **Joshua,** a highly distinguished English portrait painter, was born near Plymouth, July 16, 1723. His father designed him for the medical profession, but as he early manifested a desire to be a painter, he was placed under the instruction of Thomas Hudson, the principal portrait painter of the day, at the age of seventeen. In 1746, he went to London, and set up a studio there, but being invited to accompany Commodore Keppel on a cruise to the Mediterranean, in 1849, he made his way to Rome, and remained about three years in Italy, studying the works of Raphael and Michael Angelo, and visiting the places where the chief art collections are to be found. On returning to London, in 1752, his works attracted great attention, and when the Royal academy was instituted, in 1769, he was elected its first president. He was knighted by George III., and when Ramsay died, in 1784, he succeeded him as painter to the king. He died at his house in Leicester Square, London, Feb. 23, 1792, and after lying in state at the Royal academy, was interred in the crypt of St. Paul's cathedral. Reynolds' fame lies in the superior beauty and excellence of his portraits. He was at home alike in portraying the strength of manhood and the grace of womanhood; and his pictures of children have an especial tenderness and beauty. He was a man of fine and varied culture, and lived on terms of friendly intercourse with Johnson, Burke, Goldsmith, and other literary men of his day. He was also distinguished for an amiable disposition, and the most pleasing manners, fully justifying the eulogium of Goldsmith, which says of him:—

> Still born to improve us in every part,
> His pencil our faces, his manners our heart.

Rhad'aman'thus, in Greek mythology, a son of Zeus and Europa; one of the three judges of the dead on their descent into the nether world. The other two were Æacus and Minos (brother of Rhadamanthus), king and lawgiver of Crete. Before these three, according to the fable, all the dead appeared when they reached the lower world (hell), to give account of their stewardship and receive the reward of their deeds.

Rhea, Mademoiselle (Hortense Barbe-Loret), Belgian actress, was born at Brussels, Sept. 4, 1845, and died at Montmorency, France, May 8, 1899. She was educated at the Ursuline convent, Paris, and soon after leaving school she began to study for the stage. Her *début* was made in Brussels, and she afterward acted with acceptance at Rouen and in Paris, and in the early seventies she made a professional tour in Russia. At St. Petersburg, she became leading actress at the Imperial theatre. After this, she appeared in London, returned to France, and then paid a successful visit to the United States. Her repertory consisted of *Adrienne Lecouvreur*, *Camille*, *Pygmalion*, *Galatea*, *The School for Scandal*, *Frou-Frou*, *Nell Gwynn*, and *The Lady of Lyons*. She was very successful in a play on the subject of Napoleon adapted for her and first presented by Rhea at Buffalo in 1882. In this play she took the part of Empress Josephine.

Rhea (*rē'ā*) or **Nan'du,** the ostrich of the New World. The rheas are running birds, living in herds on the grassy plains of South America, and feeding on grasses, seeds of herbs, and some varieties of berries. Their wings are better developed than in other running birds, but do not suffice for flight. The larger varieties reach a height of about six feet. The female lays from ten to twenty-three eggs, in a depression in the ground made by the male. Their feathers are of coarser quality than those of the African ostrich, and are used mainly for rugs, dusters, and brooms. There are three species. The more common one is brownish gray above and nearly white on the belly. It ranges from southern Brazil to the straits of Magellan. Another smaller form, with some feathers having white tips, inhabits Patagonia, and a third, dark-colored form lives in northeastern Brazil.

Rheims (*rēmz*) or **Reims,** a city in the French department of Marne, about 100 miles from Paris by rail. In the 8th century it became the seat of an archbishop, and from 1179, when Philip Augustus was solemnly crowned here, it became the place for the coronation of the kings of France. Joan of Arc, after her great victories, brought the dauphin here to be crowned, and the only sovereigns down to 1825 who were not crowned here were Henry IV., Napoleon I., and Louis XVIII. In 1793, the cathedral was attacked by the populace, and in 1830 the ceremony of crowning at Rheims was abolished. The hills which surround the town are planted with vineyards, and Rheims is one of the great centers of woolen manufacture in France. Population 107,963.

Rheot'ropism, the sensitiveness of a plant to the direction of a current of water, to which it responds by changing the rate of growth, which results in a curvature with or against the current. When roots of corn or vetch are

grown in moving water, the rate of growth is hastened on the side not struck by the current and slowed on the other side; consequently the tip is turned up-stream. A very slow current will produce the reaction. The exact nature of the stimulus has not yet been determined. See IRRITABILITY.

Rhett (*ret*), **Robert Barnwall,** an American editor, politician, and prominent "secessionist," was born at Beaufort, S. C., Dec. 24, 1800, and died in St. James Parish, La., Sept. 14, 1876. Early in life he adopted the name of Rhett, his real name being Smith. In 1826, he was elected to the legislature of his native state and in 1832 became attorney-general of South Carolina. He subsequently served a number of terms in congress and in 1851–52 was United States' senator. He was an ardent advocate of extreme state-rights views, which he openly expressed both in congress and in the Charleston *Mercury*, which he owned and advocated. During the secession agitation in South Carolina, he advocated the dissolving the Union and voiced the sentiments of the nullifiers and ultra-secessionists. He took a prominent part in the organization of the Confederate government and helped to pass the ordinance of secession. At the close of the war he retired from public life.

Rhine, the most important river in Germany, and one of the most noted in Europe, takes its rise in Switzerland, and, after a northerly course of about 850 miles, empties into the German ocean. The area of the Rhine and its various feeders is estimated at nearly 100,000 square miles. It is divided into the Upper, Middle, and Lower Rhine, the first of these terms being applied to the river from its source to Basel, the second to its course from Basel to Cologne, and the third to its course from Cologne through the Netherlands to the sea, into which it empties by several mouths, forming an extensive delta. Several canals connect the Rhine with the Rhône, the Danube, and other rivers, thus opening a line of communication with France and Belgium on one side, and with the Netherlands and every part of Germany on the other. The delta of the Rhine, most of which is below the sea level, has to be protected by strong embankments or dikes, the principal ones of which are 25 or 30 feet above the lowest level of the river.

Rhinoceros (*ri-nŏs'e-rŏs*), a thick-skinned animal, with a horned snout, confined to tropical Africa and Asia. There are two species in Africa and three in Asia. The African species embrace a two-horned and a one-horned variety. The latter is the wide-mouthed rhinoceros, sometimes called "white," although its skin is of a slaty color. It is the largest of the family, a full-grown male, according to Selous the celebrated hunter, standing six and one-half feet high at the shoulders. The largest of the Asiatic species has also a single horn. It is ten feet long and five feet high at the shoulders. There are enormous folds in the skin which appear like huge plates of armor. Another form, inhabiting Sumatra, has two horns on the snout. The horn is a powerful weapon. Besides being used in attack, it is strong enough to root up small trees, which the animal sometimes does, for the sake of the fruit and foliage. They are shot with iron and tin bullets, as the hide is so tough that leaden bullets will not penetrate it.

INDIAN RHINOCEROS.

Rhizoids (*ri'zoids*). Usually hair-like outgrowths from plant bodies which act as holdfasts, and often as absorbing organs. The name means "root-like," but the similarity is by no means one of structure, but rather one of general function in relation to the outside world. Rhizoids are mostly developed by the lower plants, as for example, in connection with the anchoring of sea weeds, on the underside of the thallus bodies of liverworts, from the base of the erect moss plants, from the under side of the prothallium of ferns, etc.

Rhizome (*ri-zōm'*). See ROOT'STOCK.

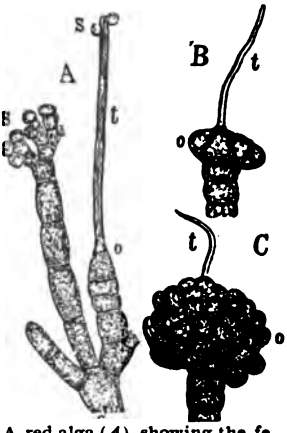
Rhode Island, one of the original thirteen states and the smallest state in area in the American Union. Its greatest length from north to south is between forty and fifty miles, and its width is less than forty miles, its land area being but little over 1,050 square miles. It is bounded on the north and east by Massachusetts, on the south by the Atlantic ocean, and on the west by Connecticut. The state is divided into five counties, its principal cities being Providence (the capital), Newport, Central Falls, Pawtucket, and Woonsocket. Narragansett bay, which occupies the southeastern quarter of the state, contains a number of beautiful islands, on the largest of which, named Rhode Island, is the city of Newport, a famous summer resort, and formerly one of the capitals of the state. The country is hilly, and the soil rough and stony, being chiefly devoted to pasturage and orchards. The inhabitants are principally engaged in trade and manufactures, there being a very large number of cotton and woolen factories in the state. Educationally the state does well for its size and resources; it has a school population of 80,000, with an average attendance of 50,000. It also maintains 18

high schools, with 170 teachers, and about 3,500 pupils. At Providence, there is the Brown university. Rhode Island was settled in 1636 by Roger Williams and his Baptist companions, who were expelled from the Puritan colony in Massachusetts on account of their religious opinions. It is also believed to have been the Vinland of the Norsemen, who explored its coast in the 10th century. Population 428,556.

Rhodes (*rōdz*), an island in the Mediterranean, belonging to Turkey, formerly an independent state of ancient Greece. It is about 50 miles long and 20 miles broad, and is traversed by a chain of mountains, the highest peak of which, Mt. Artemira, reaches a height of 4,070 feet. The island, whose ancient name was Rhodos, was inhabited at a very early period, and is said to have sent nine ships to the Trojan war. In the year 404 B. C., the city of Rhodes was founded at the northern extremity of the island, and after that the history of the island is comprised in that of the new city. The city of Rhodes was girt about by strong walls surmounted by towers, and was furnished with two good harbors. At the entrance to one of its ports stood a brazen statue of Helios, 70 cubits in height, and called the Colossus of Rhodes. Besides this statue, which was one of the seven wonders of the ancient world, there were 3,000 others in the city, of which 100 were colossal. The arts were cultivated in Rhodes, and intellectual activity showed itself long after it had declined in other parts of Greece. Like the remainder of Greece, the Rhodians submitted to the victorious Alexander the Great and received a Macedonian garrison, but on the death of Alexander, 323 B. C., they revolted and expelled the intruders. From this time until the overthrow of the Macedonian empire, was the most prosperous period in the history of Rhodes. After the death of Julius Cæsar, whose side the Rhodians had taken in his contest with Pompey, they were defeated in a naval engagement by Cassius, who entered the city by force, seized the public property, and rifled the temples. During several centuries Rhodes remained under the power of the Byzantine emperors. In 1309, it fell into the hands of the Knights of St. John of Jerusalem, who retained possession of it until 1523, when they were besieged by the Turks and compelled to sail away to Crete; and the island has remained a Turkish possession ever since.

Rhodes (*rōdz*), Rt. Hon. **Cecil John,** P. C., English South African statesman, railway projector and mining operator, was born at Bishop Stortford, England, where his father was rector of the parish, July 5, 1853. After graduating at Oxford, he went to the Cape of Good Hope in 1871 for his health, and settled at Kimberley, engaged in diamond mining, and began to dream of a united British South Africa, and of a railway project that would connect the Cape with Zambesi, and ultimately through the Egyptian Sudan to Cairo. Cape politics for a time attracted him, and he entered the local legislature and became prime minister, but resigned in consequence of the Jameson raid. In 1893, in alliance with the Dutch Afrikander party at the Cape, he took the field against the warlike Metabeles and subdued them; after which he obtained mining rights over what is now Rhodesia, which he has done much to develop. By this time, while working out his schemes of British expansion in the country, he formed the great De Beers mine consolidation, where he amassed great wealth. When war in the Transvaal broke out, he went to Kimberley, and remained there during the investment of the great diamond mining town by the Boers, raising and equipping at his own expense a town guard of 400 men, at a cost of $75,000. He died Mar. 28, 1902.

Rho'dophy'ceæ, plants commonly known as the red algæ. The red color is due to the presence of a pigment in addition to the ordinary chlorophyll which belongs to all algæ. They are mostly marine forms and are anchored by holdfasts, belonging to the deepest waters in which algæ grow. Their bodies are much more delicate than those of the brown algæ, or "kelps," their graceful forms, delicate texture, and brightly tinted bodies (shades of red, violet, dark purple, and reddish brown), making them very attractive. They show the greatest variety of forms, branching filaments, ribbons and filmy plates prevailing, sometimes branching very profusely and delicately and resembling mosses of fine texture. They are among the most prized souvenirs of a visit to the seashore. Red algæ are very peculiar in both their asexual and sexual reproduction. Every sporangium contains just four asexual spores, and contrary to the usual alga habit these spores have no cilia or power of motion. Since they are always produced in fours they are called "tetraspores." The female sex organ is also very peculiar. In the ordinary algæ the oögonium consists of a single large spherical cell. Among the red algæ, however, this spherical cell is transformed into a flask-like body, with bulbous base and an elongated almost hair-like neck. This female organ on account of its peculiar-



A red alga (*A*), showing the female organ (*o*) with its trichogyne (*t*), the male cells (*s*), and the resulting spore case (*B, C*).

ities is often called by a special name, "carpogonium," the tubular hair-like process being called the "trichogyne." The male cells come in contact with the trichogyne in the process of fertilization.

Rhone (*rōn*), the only important French river which falls into the Mediterranean, takes rise in the Swiss Alps, not far from the sources of the Rhine, its entire length being about 500 miles. There is sufficient water in the Rhône for good-sized vessels from Lyons southward, but on account of the rapidity of the current and the shifting of sand-bars, navigation is difficult and at times impossible. On account of these obstructions, which are greatest near the mouths of the river, communication with the Mediterranean is in great part dependent upon the canals which connect the Rhône with the Rhine, the Seine, and other rivers.

Rhu'barb, species of *Rheum*, a genus of the buckwheat family. Common garden rhubarb or "pie-plant" is *R. rhaponticum*, native to the Old World. The genus is very closely related to the common docks, many of which resemble the rhubarb in habit.

Rib'bon, a narrow band or strip of woven silk. Ribbons have been made an important article of commerce only during the last two centuries, the chief seats of their manufacture being Etienne, France; Basel, Switzerland; and Coventry, England. Of the names which indicate the kind of groundwork, grosgrain is a ribbed silk, plush a velvety or piled surface, satin a smooth, polished surface, etc.; and there are various mixtures of these, making an almost infinite variety of decorative effects, both in color and weaving.

Ricardo (*re-kär'dō*), **David,** an eminent political economist, was born of Jewish parentage, at London, April 19, 1772. At an early age he became a partner with his father as a stock-broker, but when he married outside the Jewish race, a misunderstanding arose between them and the partnership was dissolved. Young Ricardo then set up in the same business himself, and in a few years realized a large fortune, while preserving an honorable reputation throughout his business career. In 1809, he published a pamphlet entitled, *The High Price of Bullion a Proof of the Depreciation of Bank-notes*, which was a very clear and able argument in favor of a metallic basis for the currency of a country. After publishing a number of other successful pamphlets, Ricardo brought out his greatest work, and the one on which his fame chiefly rests, *On the Principles of Political Economy and Taxation.* This work, while not a complete treatise on political economy, may be regarded as a very able discussion of some of its principal factors, such as value, wages, rent, etc. Ricardo entered parliament in 1819, and retained his seat in that body until his death, which took place at Gatcomb Park, Gloucestershire, Sept. 11, 1823.

Rice, the well-known grain of *Oryza sativa*, extensively cultivated in Asia, where it is also native. The genus belongs to the grass family and contains about 20 described species, and perhaps these may all be considered as varieties of *O. sativa.* Rice supplies food for more human beings than does the product of any other plant. It is the principal, and often the only, food of millions in China, India, and the Malayan islands.

Rich'ard I., king of England, surnamed the "Lionhearted," was born at Oxford, Sept. 8, 1157, and by the death of his father, Henry II., became king July 6, 1189. Being a born soldier and thirsting for military glory, soon after his coronation Richard raised a large force of soldiers with which he joined the third crusade, then about to leave Europe for the Holy Land. He united his forces with those of Philip, king of France, at Vezelai; but at Lyons the two armies, numbering in all about 100,000 men, separated and proceeded by different routes to Sicily, where they again met. Here Richard betrothed his nephew Arthur to the infant daughter of Tancred, king of Sicily, with whom he formed a close alliance. On June 4, 1191, Richard reached the camp of the crusaders, then assembled near Acre, and shortly afterward that stronghold surrendered, the siege having lasted two years. Richard's march to Joppa along the seashore, his advance upon Jerusalem at Christmas, his capture of the fortresses in the south of Palestine, his second advance upon Jerusalem (the city he never beheld), his relief of Joppa — these and other deeds gave him a great name for heroism and valor, but brought no decisive advantage to the crusade. On Richard's way home, in 1193, he was shipwrecked in the Adriatic, and wandering in disguise through the dominions of his enemy, the archduke of Austria, he was recognized, seized, and handed over to the Emperor Henry VI. Being ransomed by his loyal subjects, Richard returned home the next year, and almost immediately afterward engaged in war with Philip of France, in which contest he was killed by an arrow shot from the castle of Chaluz, near Limoges, April 6, 1199.

Rich'ard II., king of England, and second son of the Black Prince and Joanna of Kent, was born at Bordeaux, April 13, 1366, and succeeded to the throne on the death of his grandfather, Edward III., June 28, 1377. The reign of Richard is a very interesting epoch of English history, as the newly-established house of commons was eager to claim a share of political power, and the laboring classes were seeking to be freed from the bondage under which they had so long suffered. During the first years of Richard's reign — he being only eleven years of age when he came to the throne — the government was in-

trusted to a council of twelve, and although the king's uncle, John of Gaunt, was nominally excluded from this council, he was generally regarded as the real head of the government, and was held responsible for the heavy taxation and other abuses of which the nation complained. In the midst of the conflicts of contending factions, and after several impeachments and executions had taken place, in the year 1389 Richard declared himself of age and took the government into his own hands, and for several years the country enjoyed peace and a fair degree of prosperity, until the king became involved in a number of quarrels with the earls of Warwick, Arundel, and others. Warwick was banished and Arundel beheaded, and after having triumphed over his enemies Richard now began to quarrel with his friends. A misunderstanding having arisen between the duke of Norfolk and Henry, duke of Lancaster, Richard sent the former into banishment for life and the latter for ten years. But on Richard's return from an expedition into Ireland, in 1399, he found that Lancaster had landed in England and raised a large army during his absence, with which he was then marching to London; and in addition to this, the army which Richard had taken with him into Ireland no sooner landed in England than it almost entirely deserted him and passed over to the invader. Richard met Lancaster at Flint castle, where he formally resigned his crown and was carried captive to London and placed in the Tower. A month later, Lancaster was proclaimed king as Henry IV., and Richard was condemned to imprisonment for life. In the following February, Richard's body, or what was supposed to be his body, was brought from Pontefract castle and shown to the public. According to some accounts, he was murdered in the castle, in February, 1400; while, according to others, he escaped to Scotland and died there a lunatic.

Rich'ard III., king of England, was the youngest son of Richard, duke of York, and the great-grandson of Edmund, duke of York, the fifth son of Edward III. He was born at Fotheringay, Oct. 2, 1452. On the defeat and death of their father in 1460, he and his brother George, afterward duke of Clarence, were sent by their mother to Utrecht, where they remained until the crown was won from Henry VI. by their eldest brother, Edward IV. In 1471, Richard led the van of his brother's army at Barnet, and also took an active part in the decisive victory at Tewkesbury. It is claimed that after the battle he and Clarence murdered Prince Edward, son of Henry VI., and in some quarters it is believed that he was concerned in the murder of Henry himself in the Tower. Edward IV. died April 9, 1483, leaving Richard guardian of his son Edward V., then only thirteen years of age; but instead of faithfully fulfilling this trust, Richard placed the boy and his younger brother in the Tower, and had himself proclaimed king. And not content with thus depriving young Edward of his crown, Richard caused him and his brother to be murdered while they were in the Tower, hoping thereby to make his own power the more secure. But Richard's numerous crimes made him so unpopular, that when Henry Tudor, earl of Richmond, arrived in England with an invading force, in 1485, he soon raised such an army that, at the battle of Bosworth, Richard lost both his crown and his life (August 22), and was succeeded by his antagonist as Henry VII.

Rich'ardson, Samuel, a famous English novelist, was born in Derbyshire, in 1689, and died at London, July 4, 1761. He says of himself that he had only "common school learning," and at the age of sixteen he was bound to John Wilde, a printer, with whom he served the usual period of apprenticeship. After working as a journeyman printer for a number of years, in 1719 he set up an establishment of his own, in which he attained a fair degree of prosperity. In November, 1740, when Richardson was over fifty years of age, he published his first novel, *Pamela, or Virtue Rewarded.* So popular was this book that a second edition was published in February following, a third edition in March, and a fourth in May. Eight years later, appeared the work which is generally considered Richardson's masterpiece, *The History of Clarissa Harlowe.* Dr. Johnson declared this book to be the first in the world for its knowledge of the human heart; and Fielding says of it: "Such simplicity, such manners, such deep penetration into nature, such power to raise and alarm the passions, few writers, either ancient or modern, have been possessed of." Having drawn the ideal woman in "Clarissa," Richardson proceeded a few years afterward to portray in "Sir Charles Grandison" the perfect man, "the man of true honor." This is considered a work of great ability, but not equal to *Clarissa.* Perhaps the most striking proof of Richardson's native genius is found in the fact that his method of telling a story by correspondence, and his extreme diffuseness, either of which would be fatal to most writers, seem to give him only a firmer hold upon his readers and to increase and intensify the reality of his creations. See the essay of Mrs. Oliphant (*Blackwood's Magazine*, March, 1869).

Richelieu (*rēsh'e-lō*), **Armand Jean du Plessis,** Cardinal Duc de, was born at Paris, Sept. 5, 1585, and was educated for the military profession at the Collège de Navarre. In 1607, he was consecrated bishop of Luçon, and for some time devoted himself to the duties of his diocese; but when a rupture occurred between the king and the queen-mother some years later, Richelieu was very active in securing a reconciliation between them, thereby laying the foundation of the

great influence he afterward exercised. In 1622, Richelieu was made cardinal, and in 1624, became minister of state, a position which, in spite of all opposition, he held until the end of his life. At one time the king had determined on dismissing him, but in an interview at Versailles, Richelieu so worked upon the weakness and fear of the monarch, that his supremacy was fully established from that day. Several important results attended Richelieu's administration of French affairs, of which the most important was the establishment of the absolute authority of the king, which during the feudal period was much abridged by the power of the nobility. By vigorous, and often cruel and unscrupulous measures, Richelieu succeeded in breaking down all the great nobles who opposed him, some of whom he brought to the scaffold, and sentenced others to lifelong imprisonment; so that, when he died, there was scarcely any check upon the exercise of the king's prerogative. Another of his great enterprises was the overthrow of the Huguenot party as a political power, which he completely effected by the siege and capture of Rochelle in 1628. At the same time he secured for the Huguenots a certain measure of toleration; and, on the whole, it is conceded that he used his success in this conflict with great moderation. In his foreign policy, the chief object of which was to humble the power of Austria, he was equally successful. With this great end in view he allied himself with the German Protestants and even with the great champion of the Protestant cause, Gustavus Adolphus, of Sweden. He died at Paris, while at the height of his power and authority, Dec. 4, 1642. See *Le Cardinal Richelieu*, by Dussieux.

Rich'mond, capital of Virginia, is situated on the left bank of the James river, about 150 miles from its mouth, and a little over 100 miles from Washington. The James river here supplies immense water-power; and the city contains nearly 1,000 manufacturing establishments, with a capital amounting to several million dollars. The chief of these are tobacco factories, rolling mills, iron foundries, etc. In 1861, Richmond was selected as the capital of the "Southern Confederacy," and throughout the war was the "objective point" for all the aggressive movements of the eastern army of the Union, until the seizure of its lines of supply by General Grant compelled its evacuation by General Lee, on the night of April 2, 1865. A portion of the city was burned by the retreating Confederates; but in the years that have followed the war the city has more than recovered her former beauty and prosperity. Her population in 1860 was 37,910; in 1900, 85,050.

Rich'mond, a city of Indiana, on the east fork of Whitewater river, 70 miles by rail from Cincinnati, and about the same distance from Indianapolis. It was founded by the Society of Friends, who established a college for both sexes in the place in the year 1859. Population 18,226.

Rich'mond, Leigh, English clergyman, author of *The Dairyman's Daughter*, was born at Liverpool, Jan. 29, 1772, and while a child was lamed for life by leaping from a wall. He studied at Trinity college, Cambridge, and after filling the joint curacies of Brading and Yaverland, in the Isle of Wight, for a number of years, in 1805, he was appointed to the rectory of Turvey, in Bedfordshire, where he died May 8, 1827. Besides *The Dairyman's Daughter*, he wrote the *Negro Servant* and *Young Cottager*, which three tracts have carried his name over the civilized world. Collected, they form the *Annals of the Poor*.

Richter (*rich'ter*), **Jean Paul Friedrich** (usually known by his pseudonym "Jean Paul"), was born March 21, 1763, at Wunsiedel, in North Bavaria, and after attending school in the town of Hof for a number of years, was sent to Leipsic to study theology. But Rousseau, Voltaire, and other authors had much greater attractions for him than theology, and he, too, resolved to write books. His first literary efforts were satires, but he could get no publisher for them, and for several years he carried on a desperate struggle against poverty, continuing to read and study with actual hunger as his daily companion. In 1785, he left Leipsic to avoid imprisonment for debt, and took refuge with his widowed mother at Hof. Here his circumstances were made a little easier, and he spent a number of years as private tutor in wealthy families. For a long time Richter seemed destined to failure as a writer, but in 1793 there was a turning point in his fortune, his work entitled *The Invisible Lodge* proving unexpectedly successful. It was followed by other works which brought him a liberal pecuniary reward and gave him high rank among the literary men of his age. In 1801, Richter married and settled down at Bayreuth, where he spent the remainder of his days writing his books, tending his pet animals, playing with his children, and taking short summer journeys to different towns in Germany. The principal works written during his married life were *Titan* and *Wild Oats*, the former accounted by himself and most German critics his masterpiece. His last years were clouded by total blindness and the death of his only son, a promising student, in 1821. Jean Paul is perhaps the most unique character in German literature, the chief of humorists, and in the language of Carlyle, "a colossal spirit, a lofty and original thinker, a genuine poet [in prose], a high-minded, true, and most amiable man." He died at Bayreuth, Nov. 14, 1825. See *Life of Jean Paul F. Richter*, by De Quincey.

Rick'etts, General, **James B.,** an American general, was born at New York in 1816, and

graduated at West Point in 1839. He served in various kinds of frontier duty, and in the Mexican war until the Civil war broke out, in 1861, when he was made brigadier-general of volunteers, and continued in active service with the army of the Potomac until the close of the struggle. Among other battles in which he participated, were Bull Run, South Mountain, Antietam, Monocacy, Cedar Creek, the Wilderness, Siege of Petersburg, etc. He retired from the army with the rank of major-general, Jan. 3, 1867, and died at Washington, D. C., Sept. 22, 1887.

Rid'dles may be defined as questions or propositions containing a more or less hidden meaning, which is to be discovered by guessing. At the present day, the propounding and solving of riddles is a mere pastime, but in ancient times they were put to more important purposes, being used to some extent for purposes of practical instruction and intellectual discipline. Homer is said to have died of chagrin because he could not solve a riddle, and every reader of the Old Testament is familiar with the riddles which Samson proposed to the Philistines. They first came into use in Greece about the time of the "Seven Wise Men," one of whom was celebrated for the composition of metrical riddles. The riddle was much cultivated in Europe during the middle ages, although it was a means of amusement rather than an intellectual exercise. The Abbé Cotin published a collection of his own riddles and those of his contemporaries, in which he styled himself *Le Père de l'Enigme* ("the father of the riddle"), but his claim has not been recognized by posterity.

Rid'ley, Nicholas, Protestant martyr, was born at Wilmontswick, Northumberland, about the year 1500, and after graduating at Pembroke Hall, Cambridge, in 1522, was ordained priest in 1524. He next went to Paris and to Louvain, and having met some of the most active reformers while abroad, after a three years' absence, he returned to England an ardent believer in the doctrines of the Reformation, quickly making himself one of the foremost leaders of the church. In 1547, he was made bishop of Rochester, and when Bonner was deposed from his position as bishop of London, Ridley was appointed his successor. He assisted Cranmer in the preparation of the forty-one articles, afterward reduced to thirty-nine, and in 1552 visited the Princess Mary at Hunsdon, but failed to convert her from the Catholic faith. After the death of Edward VI., Ridley espoused the cause of Lady Jane Grey, even going so far as to preach a sermon in which he declared both Mary and Elizabeth illegitimate. For this offense he was stripped of his office and dignities and committed to the Tower. In March, 1554, he was taken to Oxford to be tried by a commission, named by Cardinal Pole, for heresy, and after being kept in prison for eighteen months, and resisting all influences to make him recant his views, he was burned at the stake in front of Baliol college, Oct. 16, 1555. See his *Life*, by Dr. Gloucester Ridley.

Rid'path, John Clark, American historian and educator, was born in Putnam county, Ind., April 26, 1841, and died at New York city, July 31, 1900. After graduating in 1863, at Asbury (now De Pauw) university, he entered upon the profession of teaching. In 1869, he was appointed professor of literature at Asbury, and ten years later became vice-president of that university. To his alma mater he was instrumental in procuring its handsome endowment from Mr. De Pauw, when the university took that gentleman's name. Subsequently he gave himself entirely to literature, accepting the editorship, for a couple of years (1897–98), of *The Arena*. From his industrious pen came histories and cyclopædias and biographies. Among the latter are lives of Alexander Hamilton, Garfield, W. E. Gladstone, together with a history of Texas; an academic history and a popular history of the United States; *A Cyclopædia of Universal History*, and a compendious treatise on *The Great Races of Mankind*.

Rienzi (*rē-en'zē*), **Nicolas Gabrini,** generally called Cola di Rienzi, was born at Rome in 1313. His advantages of education were excellent, and nature had bestowed upon him a marvelous gift of eloquence. The assassination of his younger brother, by a Roman noble whom he found it impossible to bring to punishment, aroused his feelings against the aristocratic families of the city, and he determined, if possible, to destroy their power and overthrow them. In 1343, in company with Petrarch and others, he visited the papal court at Avignon to induce Clement VI. to return to Rome to protect the citizens from their oppressors. The pope received Rienzi with favor and appointed him notary to the civic chamber. Rienzi returned to Rome in 1344, and for three years loudly and openly threatened the nobles with revolution. At last he summoned the citizens together, and surrounded by the pope's legate and a number of trusted confederates, and followed by one hundred horsemen, he proceeded to the capitol, where he assumed the title of tribune and was invested with complete dictatorial power. The pope confirmed Rienzi in his authority; all Italy rejoiced in his success; and many predicted a revival of the power and majesty of the Eternal City. But the nobles were still bitterly hostile, and, although Rienzi won a great victory over them when they attempted to rise against him, the pomp and luxury which he sought to maintain involved him in such expense that he was compelled to levy heavy taxes for the support of his government. These taxes aroused so much opposition that, after a short reign

of seven months, he left the city and fled to Naples. After a two years' residence among the Franciscans in the Apennines, he went to Prague to secure the support of the Emperor Charles IV. in another effort to deliver Rome from the power of the nobles. Charles, however, was so amazed at his schemes of revolution and ambition that he sent him as a prisoner to the pope at Avignon, but by the mediation of Petrarch he was released. Innocent VI., the successor of Clement, now resolved to use Rienzi as a means of crushing the Roman nobles, and accordingly sent him to Rome in the train of Cardinal Albornoz. Their object was speedily accomplished, and Rienzi, having borrowed money and raised a body of soldiers, made a triumphal entry into Rome and was received with universal acclamation. But, alas, adversity had soured Rienzi's temper without teaching him wisdom and moderation. The same defects of character that had characterized his former administration again revealed themselves, and in two short months the opposition to him became so great that he was assassinated at the foot of the capitol stairs, his head being cut off and his body subjected to the greatest indignities (Oct. 8, 1354). The history of Rienzi has been made the basis of a very thrilling romance by Bulwer. See the histories of mediæval Rome, by Gregorovius and by Reumont.

Ri'fles were invented for the purpose of securing more accurate firing of bullets than was possible with the smoothbore gun. As the ball never fitted tightly in the smoothbore, its center was always below the center of the bore; and in consequence of this, a part of the explosive force of the powder escaped over the top of the ball, and was not only wasted, but exercised a downward pressure on the ball in its passage through the barrel. So great was this downward pressure that in guns of soft metal, as brass, a perceptible dent was produced on the under side of the barrel after a few rounds. Another more important consequence of the looseness of the ball was that in its irregular motion along the barrel, it was pressed now against one side and now against the other, and therefore its direction after discharge was not determined by the line of the barrel, but by the particular point of the muzzle with which it happened to be in contact at the instant of discharge. As early as 1498 the citizens of Leipsic possessed the germ of the present rifle, except that the grooves in their guns were straight; and in the year 1520 Augustus Kutter (or Koster), of Nuremberg, invented a spiral-grooved rifle, which was at least the starting point in all the improvements in rifled guns that have been made down to the present day. The spiral groove, when the bullet fits into the grooves, causes the bullet to revolve on its axis with a rapidity in proportion to the force of the explosion and the sharpness of the twist in the spiral. This revolution of the bullet on its axis causes it to move in the line of the barrel, subject only to the force of gravity, which eventually brings it to the ground. But for nearly three centuries after this the cost of rifled guns and the difficulties connected with their manufacture limited their use to the purposes of the chase. The 95th regiment of the British army was armed with "Baker's rifles" in the year 1800; and the revolutionary government of France issued rifles to a portion of their troops soon after. During the War of 1812, the American army demonstrated the value of rifles in war; but many years were yet to elapse before they were generally placed in the hands of soldiers.

In the year 1837 a rifle invented by Captain Delvigne was issued to a few regiments in the French army, and four years afterward the Prussians equipped their entire army with the celebrated needle gun, which proved its superiority over all rifles previously invented. The next step in advance was the rifle invented in 1849 by Captain Minié of the French army, in which the spherical bullet was discarded and its place supplied by one in the form of a cylinder with a conical point. The base of the bullet was hollow, so made to contain an iron cup which was driven by the force of the explosion into the bullet, causing the lead to expand into the grooves of the barrel. Notwithstanding all the advantages of the minie gun, it was found too heavy for effective service; and in 1853 the British Enfield rifle was invented, in which, besides other improvements, the diameter of the bore was reduced about one-eighth of an inch. This diminished the weight of the gun very materially without impairing its force or accuracy in any manner. From 1853 to 1865 this was the weapon of the British army, and in the last-named year the Enfield was converted into a breechloader by attaching to it the Snider breech-loading mechanism. This arrangement was, however, only temporary, and after numerous trials and experiments the Henry barrel, in connection with the Martin breech, was adopted in 1871, the first issue to troops being made in 1874. In the year 1855, the United States adopted what was known as the Springfield rifle, of which the caliber was .58 inches, the bullet, which was cylindro-conical in form, weighing 500 grains and the powder charge 60 grains. During the Civil war, it became necessary to issue Enfield and other rifles to the various regiments called into service, but the Springfield, with its various improvements, continued to be the standard arm of the United States up to 1893, the rifle issued to the regular army and the militia being the Springfield breechloader, caliber .45. This was displaced, however, in 1893, by the Kragg-Jorgensen .30 caliber magazine rifle, model 1892, which was adopted after competitive test, and is now the standard arm of the United States. See

Treatise on Small Arms and Ammunition, by Lieutenant-colonel Bond, R. A.

Riga (*rē'ga*), capital of Livonia, and the third seaport of Russia, lies on the Dwina river, seven miles from its mouth, and 350 miles from St. Petersburg. The old town has narrow streets and mediæval houses and stores; but the suburbs are laid out in broad streets with handsome buildings. Its manufactures are numerous and varied and give employment to several thousand people. Riga was founded in 1201 by Albert, bishop of Livonia, and soon became a first-rate commercial town and a member of the Hanseatic league. It belonged to Poland from 1561 till it was taken by Gustavus Adolphus in 1621, and in 1710 it was finally annexed to Russia. Population 256,197.

Riggs, Elias, D.D., LL.D., was born at New Providence, N. J., Nov. 10, 1810, and after graduating at Amherst college in 1829, and Andover Theological seminary in 1832, became a missionary of the American Board at Athens, Greece, subsequently removing to Constantinople, at which places he acquired a knowledge of modern Greek, Turkish, Bulgarian, and several other languages. In addition to other work, he has translated the Bible into Bulgarian, and assisted in revising the Turkish version. He has published *A Manual of the Chaldee Language*, *Brief Grammar of the Modern Armenian Language*, and other learned works.

Riggs, Stephen R., was many years a missionary of the American Board among the Dakota Indians, and in connection with Dr. Williamson, furnished them a translation of a greater portion of the Bible. He also published a *Grammar and Dictionary of the Dakota Language*, which is considered a very important contribution to American philology. The degree of D.D. was conferred upon him by Beloit college in the year 1873. During the Sioux war of 1862 he was obliged to flee with his family from the mission near Fort Snelling. When the expedition went against the hostile Indians he was its chaplain. He was born at Steubenville, O., March 23, 1812, and died at Beloit, Wis., Aug. 24, 1883.

Ri'ley, James Whitcomb, American author, familiarly known as "the Hoosier poet," was born at Greenfield, Ind., in 1853. After a desultory education, he began contributing verse to the newspapers of a dialect character, not a little of which, though simple and at times prosaic, is tender and touching. The success of his work led to his reciting his poems in public, chiefly those in the Hoosier dialect, caught and utilized as a remembrance of his early life on a farm in the Hoosier (Indiana) state. His best-known productions are, *The Old Swimmin' Hole, and 'Leven other Poems*, *The Boss Girl, Character Sketches and Poems*, *Afterwhiles*, *Green Fields and Running Brooks*, *Old Fashioned Roses*, *A Child-World*, *Pipes o' Pan at Zekesbury*, *Flying Islands of the Night*, *Rhymes of Childhood*, *Armazindy*, *Poems Here at Home*, *An Old Sweetheart of Mine*, *Neighborly Poems*, and *Rubaiyat of Doc Sifers*.

J. WHITCOMB RILEY.

Rimini (*rē'mē-nē*), a city of Italy, on the shore of the Adriatic, seventy miles from Bologna; it is still surrounded by walls, and contains many mediæval buildings. The spot where Cæsar stood to address his soldiers, after crossing the Rubicon (about ten miles northwest of Rimini), is marked on one of the squares by a monumental pillar, and beside one of the gates stands the triumphal arch, forty-six feet high, erected in honor of Augustus. Population 13,000.

Rine'hart, William H., an American sculptor, was born in Frederick county, Md., Sept. 13, 1825. He received only a common school education, and at the age of twenty-one years apprenticed himself to a marble worker in Baltimore. So great was his interest in his trade, and so close his attention to his duties, that in two years he was put at the head of the ornamental work in his establishment. In 1855, when thirty years old, he went to Italy with the determination to be a sculptor; and after a two years' course of instruction and practice in Florence, he brought back two bas-reliefs of such unquestioned merit, that no critic could fail to recognize his artistic talent. After remaining in Baltimore about a year, he went to Rome, where he continued to work until his death, his orders for portrait busts becoming so numerous that he generally had one or two years' work ahead. A bronze statue of the late Chief-justice Taney, made by Rinehart under a commission from the state of Maryland, was unveiled in Annapolis in 1872. Among his greatest works are the *Angel of the Resurrection*, *Woman of Samaria*, and *Clytie*. This last work was on exhibition in the Peabody institute of Baltimore. He died at Rome, Oct. 28, 1874, leaving the sum of $45,000 as a fund for the aid of indigent students of art.

Rio Gran'de, a large river of North America, rises in the San Juan mountains in Colorado, and flows southeastward, forming the boundary between Texas and Mexico, its length being about 1,800 miles. It is for the most part a shallow stream, but small steamboats can ascend it for nearly 500 miles. Its chief tributary is the Rio Pecos.

Rio de Janeiro (*rē'ō de ja-nā'rō*), capital of Brazil, stands on the west side of one of the finest natural harbors in the world. The city and its suburbs stretch nearly ten miles along the shore, while great mountain ranges shut in the background. About three miles southwest of the city stands the precipitous cone of Corcovado, up which a cog railway carries 100,000 visitors every year to enjoy the magnificent view of land and sea, which the point affords. The city is the commercial, as well as the political, capital of the Brazilian republic, sending out more than half of the exports

of the country and bringing in 45 per cent. of the imports. The exports of Brazil amount to about $125,000,000 yearly, the greater portion of this amount being derived from coffee. In the month of January, 1531, Alphonso de Sanza, a Portuguese captain, entered the bay, and thinking it the mouth of a large river, named it Rio de Janeiro—that is, January river; but the city was not founded until 1536. Its present population, including many foreigners, is 780,000. The state of Rio de Janeiro has an area of 26,630 square miles, and an estimated population of about 900,000.

Rio Negro (*rē'ō nā'grō*), one of the principal affluents of the Amazon river, rises as the Guiana in southeastern Columbia, and flows east into Venezuela, then south into the Amazonas in Brazil, and again east and southeast until it joins the Amazon at Manaos, after a course estimated at 1,350 miles. It is over a mile broad when its clean inky-black stream enters the yellow, muddy Amazon.

Rip'ley, George, was born at Greenfield, Mass., Oct. 3, 1802, and after graduating at Harvard college, in 1823, studied theology there and was ordained to the pastorate of a Unitarian church at Boston. This he held until 1841. In the meantime he had become one of the leading spirits in the Transcendental movement, the first meeting of the club being held at his house in 1836; and on leaving the pulpit he started the Brook Farm experiment. This came to an end in 1847, when Ripley removed to New York and engaged in literary and journalistic work. He died July 4, 1880. See *Life*, by O. B. Frothingham, in "American Men of Letters."

Rip Van Win'kle, the hero of Washington Irving's delightful sketch, first published in 1820, is an idle, good-natured, henpecked scapegrace, who, with his gun and dog, seeks a refuge from the scolding of his sorely tried and ill-tempered wife in the forests of the Catskill mountains. There he falls in with Hendrick Hudson and his crew of the *Half Moon*, who are playing at ninepins in a secluded hollow, the balls sounding like peals of thunder along the sides of the mountain. Rip is directed to wait on them, and while in this service drinks of their liquor until his senses forsake him and he falls asleep. He wakens on a bright summer morning twenty years afterward, to find his dog gone and a rusty firelock by his side, and when he returns to his native village he sees new buildings and new faces on the street. His own house has fallen into decay; his wife is dead, and he who went away a subject of George III. has returned to find himself a citizen of the United States. This story has been dramatized, but no version has held the stage except the one with which the name of Joseph Jefferson has been identified.

Ristori (*rēs-tō'rē*), **Adelaide,** an Italian tragedienne, was born Jan. 29, 1821, at Cividale, in Friuli. Her parents were strolling players, so that she may almost be said to have begun life in the theatre. At the age of fourteen she took a part in *Francesca da Rimini*, and in a few years became the leading actress of Italy. After acting in her own country for a number of years, she presented herself before a French audience, in 1855, and won a complete triumph, and thereafter gained additional laurels in nearly every country in Europe, as well as in the United States and South America. The *rôles* in which she especially shone were "Mary Stuart," "Medea," "Marie Antoinette," and "Lady Macbeth."

Ritsch'l, Albrecht, a German Protestant theologian, was born at Berlin, March 25, 1822, and died at Göttingen, March 20, 1889. Studying at Bonn and at Halle, he became professor of theology at the former, but subsequently accepted the same chair at Göttingen, where he became a well known exegete and the head of a school of theology bearing his name. Though he held that Christianity is a divine revelation, and that men are saved only as they are members of the Christian church, he held free views regarding inspiration, and was no believer in the supernatural. He rejected the doctrine of the trinity, incarnation, original sin, and other orthodox

religious beliefs, holding that the religious sense is the essential and ultimate fact in religion. Only a few of his published works are translated from the German. Of his works the chief are: *The Christian Doctrine of Justification and Reconciliation*, *Theology and Metaphysics*, *History of Pietism*, *Instruction in Christian Religion*, and *Origin of the Ancient Catholic Church*.

Rit'ter, Karl, an illustrious geographer, was born at Quedlinburg, in Prussia, Aug. 7, 1779, and after studying at Halle, was nominated professor of geography at Berlin in 1820, and afterward became member of the academy and director of studies of the military school. With Ritter as the founder of comparative geography began a new epoch in the history of geographical science. His chief work, *Geography in Its Relation to Nature and the History of Men*, was divided into four parts: (1) Central Asia, Siberia, China, and India; (2) West Asia; (3) Arabia; (4) Sinai Peninsula, Palestine, and Syria. His lectures were published in three volumes —*History of Geography*, 1851; *General Geography*, 1862; *Europe*, 1863. He died at Berlin, Sept. 28, 1859, and his name is perpetuated in two geographical institutions at Berlin and at Leipsic.

Rives (*rēvz*), **Amelia** (known also as Mrs. J. Armstrong Chanler, and as the Princess Amélie Troubetzkoy), American novelist, was born at Richmond, Va., Aug. 23, 1863, and early manifested a taste and strong predilection for literature. Her earliest production was a series of stories entitled *A Brother to Dragons*, which showed imagination and a certain strength. This was followed by a rather sensational and passionate work called *The Quick and the Dead*, which met, however, with considerable popularity. Her later work embraces *Virginia of Virginia*, *Herod and Mariamne*, *According to St. John*, *Barbara Dering*, *Athelwold*, *Tanis*, and a number of magazine articles. In 1896, the authoress, after being divorced from her first husband, Mr. J. A. Chanler, married a Russian prince. She nevertheless continues to make Virginia her home, her residence being at Cobham, Va.

Riviera (*rē-vē-ā'rȧ*), ("seashore"), a term applied to the narrow strip of coastland, bordering the gulf of Genoa. West of Genoa it is called the Riviera di Ponente, or western coast, and beyond Genoa the Riviera di Levante, or eastern coast. The western section is the most frequented, as it abounds in the most striking and beautiful scenery, and has numerous health and fashion resorts.

Roach, John, was born in 1815 at Mitchellstown, Ireland, and came to America in 1829. He worked for a time as machinist and then founded the Ætna iron works. During the Civil war he built many large engines, then engaged in the construction of iron vessels. In 1871, he established the Delaware River Iron Shipbuilding and Engine works at Chester, Pa., which covered 120 acres and were worth $2,000,000. He built here sixty-three large vessels. In 1885, when the navy department would not accept the dispatch boat *Dolphin*, because it was too slow, Roach made an assignment. He died at New York, Jan. 10, 1887. The *Dolphin* was afterward accepted, and the works which Roach had shut down in 1885 were reopened.

Roanoke (*rō'a-nōk'*), a river of Virginia and North Carolina, formed by the junction of the Dan and Staunton rivers, a mile above Clarksville, Va., flows southeast through North Carolina and empties into Albemarle sound. Its length is a little over 200 miles, and it is navigable for steamboats from its mouth to Weldon, a distance of 130 miles.

Roanoke', a city of Virginia on the Roanoke river, 250 miles west of Norfolk, at the junction of the Shenandoah Valley and Norfolk and Western railways. At the close of the Civil war and for some years after, Roanoke was a secluded hamlet, but by the census of 1900 it contained a population of 21,495.

Rob'ert I. (Robert the Bruce). See BRUCE, ROBERT.

Rob'ert II., king of Scotland, 1371–90, was born March 2, 1316, two years after the battle of Bannockburn. He lost both his parents in infancy, and throughout the disastrous reign of his uncle, David II., he was one of the most prominent nobles of Scotland, twice acting as regent during his exile and captivity. On David's death he obtained the crown, and became the founder of the Stuart dynasty. The wars which Robert waged with England were conducted by his barons, who shaped the policy of the kingdom according to their pleasure. The most noted features of Robert's reign were the invasions of Scotland by the duke of Lancaster ("old John of Gaunt") in 1384, and by Richard II. in 1385, and the retaliatory expedition of the Scotch in 1388, which culminated in the battle of Otterburn. King Robert died in his castle of Dundoland, in Ayrshire, April 19, 1390.

Rob'ert III., king of Scotland, was born about 1340 and came to the throne on the death of his father, Robert II., in 1390. His weakness and imbecility as a ruler virtually placed the government in the hands of his brother, the Earl of Menteith. The chief events of Robert's reign were the invasion of Scotland by Henry IV. of England, in 1400, and the retaliatory expedition of Archibald Douglas, which resulted in the terrible disaster at Homildon Hill in Northumberland two years later. Robert died of grief April 4, 1406, on learning that his son James had been taken prisoner by an English cruiser, while crossing the Channel on his way to France.

Rob'erts, Frederick Sleigh Roberts, Baron of Kandahar and Waterford, a distinguished British general, was born at Cawnpore, India, the son of Sir Abraham Roberts, Sept. 30, 1832, and was educated at Eton college and at Addiscombe and at Sandwich. At the age of nineteen he joined the Bengal artillery and served through the Indian mutiny; was present at the siege and capture of Delhi, where he was wounded; was at the relief of Lucknow, and in the battle of Cawnpore and other actions of the period. For his heroism he received the Victoria Cross. In 1868, he took part in the Abyssinian war, and also in the Lushai expedition of 1871–72, and was made a C. B. In the Afghan war of 1878 he commanded the Kuran field force, and in this affair he made his famous march from Kabul to Kandahar, effecting the relief of the latter place. For his great military feat in this war he was created a baronet, and earned from his soldiers the familiar sobriquet of "Little Bobs" or Bobs Bahadur. In 1892, he was raised to the peerage, having meanwhile served in South Africa and being given command of the British forces in India. He also received the thanks of both houses of the British parliament. In 1895, he was made field-marshal and commander of the forces in Ireland. In December, 1899, he proceeded to South Africa to take supreme command during the Boer war, where he invaded the Orange Free State and the Transvaal and turned the fortunes of that struggle in favor of the British. In the autumn of 1900, he returned to England to succeed Lord Wolseley as commander-in-chief of the army. He has published two books, one on the *Rise of Wellington*, the other *Forty-one Years in India.*

LORD ROBERTS.

Rob'ertson, Frederick William, a celebrated minister of the Church of England, was born at London, Feb. 3, 1816, his father being a captain of artillery. Robertson's early years were marked by a singular purity and uprightness and an ever-active sense of duty. For a long time he hesitated between his desire to enter the army and the call to the ministry which pressed upon his conscience, but finally decided in favor of the latter. He matriculated at Brasenose college, Oxford, in 1837, and while there ardently devoted himself to the study of the Scriptures and the standard literary works of the day. He was ordained by the bishop of Winchester in 1840, and for nearly a year thereafter held a curacy at Winchester. In the summer of 1842, he became curate to the incumbent of Christ church, Cheltenham, and here for nearly five years he labored with steady devotion, passing through the great struggle of his life, and fighting his way through many doubts and misgivings, to the realities of the Christian faith. In 1847, Robertson was called to Trinity chapel, Brighton, where in a ministry of six years he arrested the public attention by his originality, the beauty and freshness of his thought, his wide human sympathy, his knowledge of the human heart, and his interest in everything pertaining to human welfare. He showed his friendship for the working classes by establishing the Workingmen's institute at Brighton and preaching to its members the duty of culture and self-control. During Robertson's last years he suffered from a disease of the brain, which was aggravated by his nervous temperament and the misrepresentations to which he was subject on account of his liberal theological views and his sympathy for the laboring classes. His last words were: "I must die; let God do His work!" He died at Brighton, Aug. 15, 1853. See the *Life and Letters* and *Sermons.*

Robespierre (*rō'bes-pēr'*), **Maximilien Marie Isidore,** was born at Arras, May 6, 1758, and after pursuing a course of study at the college of his native town, was sent to complete his education at the College of Louis le Grand at Paris. After passing some years in diligent study, he returned to Arras and entered on the practice of the law, in which he won considerable distinction. On the convocation of the states-general, in 1789, he was elected one of the deputies and repaired to Versailles in that capacity; and it was not long until close observers noted in him a peculiar force and earnestness that gave promise of a distinguished career. "This man," said Mirabeau, "will go far, for he believes every word he says." After the death of Mirabeau, Robespierre's importance seemed to increase, and from this time forward his biography is a history of the French Revolution. In May, 1791, he proposed and carried the decree by which members of the assembly were excluded from a place in the assembly which followed, a measure calculated to insure the power of the Jacobins, of whom he had become the leader and idol. Robespierre was one of the deputies to the national convention, which was formed in 1792, and as chief of the extreme party, called "the Mountain," he was one of the main agents in procuring the execution of the king, which took place in December of that year. In the following year occurred his final struggle with the Girondists, so many of whom he sent to the scaffold during the "Reign of Terror" that lasted for several months. Marie Antoinette and the Duke of Orleans were the first victims; Danton, Camille, and others

followed, and under the so-called committee of public safety, Paris became the scene of an indiscriminate slaughter, in which thousands of lives were sacrificed. "Robespierre will follow me; I drag down Robespierre," said Danton on the scaffold. The end of the "tyrant"—such was the name given to him—drew rapidly near. A conspiracy was organized against him, and after a fierce tumult in the convention he was arrested. The next day (July 28, 1794), in company with Couthon, Saint-Just, and nineteen others, he closed his career on the scaffold. See the histories of the Revolution by Lamartine and by Taine.

Rob'in, the commonest of the American thrushes, ranging in summer from Mexico to Labrador, and Alaska. In winter, it is found from Virginia south. It is among the first migratory birds to arrive north of its winter limit. This bird is a near relative of the English blackbird. It is about ten inches long with head and tail blackish, and the rest of the upper parts olive gray. The color of the under parts is chestnut brown, except the throat, which is white with black streaks. The breast of the young robin is spotted. Its habits are too well known to require description. The robin of England and Europe is an entirely different bird, belonging to the family of warblers. See REDBREAST.

Rob Roy, the popular name for Robert McGregor, a celebrated Scottish outlaw, whose singular adventures entitle him to be considered the Robin Hood of Scotland. Rob Roy borrowed money from the Duke of Montrose to engage in cattle speculation; but as he met with heavy losses, his estates were seized by the duke on account of the debt. Being rendered desperate by his misfortunes, he collected a band of about twenty followers, and made open war on the duke, robbing him of his cattle and preventing him from receiving the rents of his tenants. Many stories are still current in the neighborhood of Loch Lomond and Loch Katrine of his narrow escapes from capture by the troops that were sent after him. Many instances have also been recorded of his kindness and liberality to the poor, whose wants he often supplied at the expense of the rich. He died in his own house Dec. 28, 1738, his funeral being attended by all the people of the district, except the partisans of the Duke of Montrose. Rob Roy's exploits have been immortalized in Sir Walter Scott's novel which bears his name.

Rochambeau (*rō-shŏn-bō'*), **Jean Baptiste Donatien, de Vimeure,** Comte de, a French marshal, was born at Vendome, July 1, 1725, and entered the army in 1742. In 1780, he was sent to America in command of 6,000 men to assist the colonies in their war for independence, and rendered effective assistance to Washington at the siege of Yorktown, the surrender of which place, by Cornwallis, brought the war to a close. During the French Revolution he was imprisoned, and was saved from the scaffold only by the death of Robespierre. He became a marshal in 1791, and three years later Napoleon made him a grand officer of the Legion of Honor. He was imprisoned during the Reign of Terror, and died May 10, 1807.

Rochefort (*rōsh-for'*), **Victor Henri,** Comte, French journalist, playwright, and Radical politician, was born at Paris, Jan. 30, 1830, a descendant of the old French nobility. At an early age he began to write boldly and humorously, but with caustic satire, in the Paris *Charivari* and in *Le Figaro*, and later on, in his journal *La Lanterne*, appeared his violent attacks on the French empire and the imperial family, which compelled him to take flight into Belgium. Here he continued his lampoons, which found their way across the frontier, and led to his election to the French legislature. Being permitted, in 1869, to return to Paris, he took his seat and at this time founded the *Marseillaise.* In this sheet he continued his attacks on Louis Napoleon, which led to a duel between his collaborator, Victor Noir, and Prince Pierre Bonaparte, in which Noir was killed. Rochefort was at the same time fined and imprisoned. In 1870, when the empire fell, he was set at liberty and for a time was a member of the government of national defense. In 1871, he founded *Le Mot d'Ordre*, and instigated many of the worst excesses of the Commune. For assailing M. Thiers and the government of Versailles, he was taken, tried, and sentenced to imprisonment for life. Subsequently he was transported to New Caledonia, from which he escaped, however, and reached Geneva. Here he remained until the amnesty of 1880, when he returned once more to Paris and established *L'Intransgeant*, only to get once more into trouble, when he fled to London until 1895, when he was again permitted to return to Paris.

Rochelle (*rō-shel'*), **La,** a seaport of France. Its harbor is still sheltered by the remains of Richelieu's famous dike, and is surrounded by fine quays, close to which lie the principal streets and squares. Many of the latter are regular and well built, and present a handsome appearance from the number of houses which are adorned with porticoes and balconies. Rochelle, which was known until the 12th century under its Latin name of *Rupella*, "Little Rock," of which its present name is a mere translation, was settled by a colony of serfs of Lower Poitou, who, fleeing from the persecutions of their lord settled on the rocky promontory between the ocean and the neighboring marshes. A stronghold of the Huguenots, it was unsuccessfully besieged in 1573, and in 1627–28 it offered a fourteen months' resistance to the forces sent against it by Cardinal Richelieu, but was at length compelled to surrender. To-day it is a fortress of France of the second class. Population 30,000.

Roch'ester, N. Y., the third city in size and commercial importance in the Empire state, is located in the Genesee river basin, seven miles from Lake Ontario. Its elevation above the lake ensures a system of perfect drainage, which, with an inexhaustible water supply, enables it to rank, in point of healthfulness, first among the cities of the state. It was settled in the year 1812; incorporated as a village in 1817 and created a city in 1834, and now contains 162,608 population. It contains 125 churches (67,000 communicants), 38 public schools (24,000 pupils), 23 parochial schools (9,000 pupils), two colleges, four seminaries, private classical and preparatory institutions, and three public libraries.

There is located here the Western New York Industrial school, a state reformatory, containing about 1,000 pupils of both sexes. Principal industries embrace the manufacture of shoes, leather products, clothing, flour, optical instruments, buttons, kodaks, photographic materials, sewer pipes, beer, tobacco, furniture, candy, canned goods, time locks, and typewriting machines. These industries have an invested capital of $52,000,000, and produce $300,000,000 worth of goods annually. The largest nurseries in the world are located at Rochester and the production of flowers and flower seeds comprises an important industry. As a shipping point the city has the advantages of nine railways, the Erie canal, and a fine harbor on Lake Ontario—the Port of Genesee. The nineteen surrounding townships, comprising Monroe county, are fertile and very productive, having a valuation of $37,000,000. The city is noted for its fine parks (700 acres), wide streets, beautiful drives, and surrounding pleasure resorts.

Rock Island, a city of Illinois, on the Mississippi river, opposite Davenport, Ia.—the two towns being connected by a wrought iron bridge which cost over $1,000,000—180 miles from Chicago. The island in the Mississippi, from which the town is named, belongs to the United States government and is used as a public park. The channel east of the island has been dammed so as to furnish immense water-power, and the city has flour and sawmills, besides foundries, machine shops, glass works, etc. Population 19,493.

Rock River rises in the southeastern portion of Wisconsin, and flows south and southwest into Illinois, emptying into the Mississippi three miles below Rock Island. Its course of nearly 400 miles is through a region much noted for beauty and fertility.

Rock'efeller, John Davidson, American capitalist and president of the Standard Oil company, was born at Richford, N. Y., July 8, 1839, and at an early age removed with his parents to Cleveland, O., where he was educated in the public schools of that city. His business career began in the office of a commission merchant in Cleveland, and in the sixties, when he showed great aptitude for commerce, he engaged in the oil business, which in its gigantic developments has yielded him an immense fortune. In the seventies and eighties, various oil-operating firms were consolidated into the giant trust, known now as the Standard Oil company, of which Mr. Rockefeller is the head. His wealth has been well and beneficently utilized, much of it (over $6,000,000) being given to the University of Chicago. He has been a princely almoner of the American Baptist church and its missionary organizations, and of Vassar college, Barnard college, and other educational and civic institutions.

Rock'et. See FIREWORKS.

Rock'ford, a thriving city of Illinois, on both sides of Rock river, about 100 miles west of Chicago. It has four bridges crossing the river, three of which are railroad bridges, four railroads, flouring, paper, woolen, and cotton mills; factories of agricultural implements, furniture, cutlery, pumps, carriages, watches, silver-plated ware, boots and shoes, wood engravings, and other products. The city is well built, and is noted for the intelligence and enterprise of its citizens. Population 31,051.

Rock'ing Stones, or **Logans,** are large masses of rock so finely poised as to move backward and forward with the slightest impulse. Some rocking stones occur near to remains of ancient fortifications, which seems to confirm the statement in one of the poems of Ossian, that the bards walked round the stone singing, and made it move as an oracle of the fate of battle. In Greece, rocking stones occur as funeral monuments, and are generally found on conspicuous places near the sea. The rocking stone of Tandil, in the Argentine Republic, 250 miles south of Buenos Ayres, weighs 700 tons, and yet is so nicely poised that it rocks in the wind, and may be made to crack a walnut.

Rocks. See GEOLOGY.

Rock'y Mountain Goat, an antelope inhabiting the Rocky mountains and mountains of Northern California from the forests to the snow line. It is a true antelope, but having a tuft of hair on the throat is commonly called a goat. It is about the size of a large sheep, and is provided with long snow-white hair. The black shining horns are six or eight inches long and project slightly backward. It is rather rare and at all times shy and difficult to approach. As the flesh is not sought for food, the animal is hunted mainly to supply museums. See Edwords' *Camp-fires of a Naturalist*, and ANTELOPE.

Rock'y Mountains, a vast system of mountain ranges lying in the western portion of the United States and the British possessions. They are a continuation of the Cordilleras of Mexico. The greatest breadth of

this mountain system in the United States is 1,000 miles and their total area is nearly 1,000,000 square miles. From latitude 32° to 40° the ranges bear nearly north and south; between latitude 40° and 45° their course is northwest; then after a more northerly bend, they keep a course nearly parallel with the Pacific coast, with many detached ranges and peaks. One of these, Mt. St. Elias, is 17,800 feet high, and marks the boundary line of longitude between Alaska and the British possessions. Mount Shasta, in the coast range in northern California, is 14,000 feet high; Fremont's Peak, near the western boundary of Wyoming, is 13,570 feet high. In British Columbia, Mt. Brown is 16,000 feet and Mt. Hooker 15,700 feet. The central range of the Rocky mountains forms the ridge which divides the rivers falling into the Pacific from those falling into the Arctic ocean, Hudson bay, and the gulf of Mexico; but between the eastern and western ranges lie the territory of Utah and territory of Nevada, in which are rivers having no outlets but such lakes as Great Salt lake in Utah and Humboldt's lake in Nevada.

Rodg'ers, John, an American naval officer, was born in Maryland, Aug. 8, 1812, his father being the Capt. John Rodgers who distinguished himself by firing the first gun on the British during the War of 1812. He entered the navy in 1828, and was commissioned captain in 1862. The next year, while in command of the monitor *Weehawken*, he captured the Confederate *Atlanta*, and was promoted to be commodore. He became rear-admiral in 1869, and was superintendent of the United States Naval observatory at Washington from 1877 until his death, May 5, 1882.

Rod'man, Thomas J., was born at Salem, Ind., in 1816, and after graduating at the United States Military academy was commissioned lieutenant of ordnance in 1841. To him belongs the honor of inventing a method of casting large guns about a hollow core and cooling the metal from the inside. He died at Rock Island, Ill., June 7, 1871.

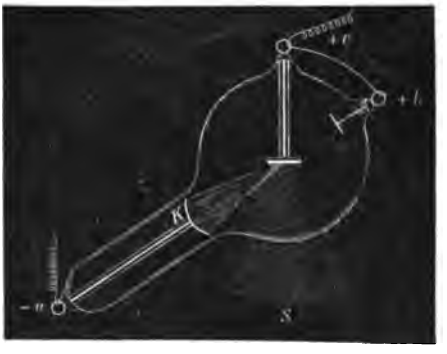
Roe, Edward Payson, American novelist, was born at New Windsor, N. Y., March 7, 1838, and, on the completion of his theological studies, became a chaplain in the volunteer service during the Civil war, and then pastor of a Presbyterian church at Highland Falls, N. Y. The great Chicago fire of 1871 furnished him a subject for his first novel, *Barriers Burned Away*, which proved very successful. In 1874, he resigned his pastorate and settled at Cornwall-on-the-Hudson, where he devoted himself to the pursuit of literature and the cultivation of small fruits. Although not a literary genius of the highest order, his stories, some twelve or fifteen in number, were all very popular, and are still widely read both in America and Europe. Among his works are *From Jest to Earnest*, *Near to Nature's Heart*, *He Fell in Love with His Wife*, *Opening a Chestnut Burr*, etc. He died at Cornwall, N. Y., July 19, 1888.

Roem'er, Ole, a Danish astronomer known principally as the man who first discovered that light travels with a finite speed; born 1644, died 1710. He was educated at the University of Copenhagen. The years from 1672 to 1681 he spent in the Paris observatory, at the end of which period he returned to Copenhagen as professor of astronomy, a position which he held until the end of his life. It was during his Paris residence that he made a study of the motion of Jupiter's satellites and showed from certain inequalities in the motion of the first satellite that the speed of light across the orbit of the earth is approximately 309,000,000 meters per second, a result which is not so very far — perhaps three per cent. — from the best modern measures.

Roemer devised the transit instrument, the meridian circle and the alt-azimuth instrument; but he was in advance of his times and their adoption was, therefore, delayed until many years after his death. See Grant's *History of Physical Astronomy*.

Roentgen (*rĕnt'gen*), **Rays.** About the beginning of 1896, Roentgen, a German physicist, long and favorably known to the scientific world, discovered that rays which are *in many respects* similar to Lenard's rays, can be observed through a very large region outside of an ordinary Crooke's tube. These are the so-called X-rays. Among the most important properties of these rays are the following: —

1. They take their origin at those points where cathode rays strike upon matter. Thus, in the accompanying figure, the cone of rays



ROENTGEN RAY TUBE.

leaving the curved cathode K, are cathode rays, while the sheaf of rays S, leaving the flat plate are X-rays.

2. Unlike cathode rays, they pass through glass, air, and various materials with little absorption.

3. Unlike ordinary light, they are not reflected or refracted, but pass straight through ordinary material without deviation.

4. They excite fluorescence in many substances, especially in platinum-barium-cyanide and some similar salts. Hence, a plate covered with these salts is widely used for observing shadows cast by X-rays. In this manner the bones of the hands, arms, etc., are easily "seen." Such a device is called a *fluoroscope.*

5. They are not deflected by a magnet as are cathode rays.

6. They produce electrolysis in air and other gases through which they pass. Such gases are made conductors by the passage of X-rays, and are said to be "ionized" or "Roentgenized." They behave in a similar way toward paraffine and some other solid insulators.

See articles BECQUEREL RAYS, CATHODE RAYS, FLUORESCENCE.

Roentgen (*rent'gen*), **Wilhelm Konrad,** eminent German scientist, distinguished investigator of physical problems, and discoverer of the "X" or Roentgen rays, was born in the province of Dusseldorf, Prussia, in 1844. Educated at Zurich and Utrecht, he became professor of physics and director of the laboratory at the University of Wurzburg, Bavaria. He also taught at Strasburg, and at Giessen. In December, 1895, he communicated to the Wurzburg Physico-Medical society his remarkable discovery of the new and powerful "X-rays," since known by his name, and in the following month he described his discovery at the celebration of the semi-centennial of the founding of the Berlin Physical society. Later, he demonstrated the rays in the presence of the Emperor of Germany, who decorated him, and Prince Ludwig of Bavaria created him a baron. The application of the "X-rays" in surgery has been fraught with wonderful and beneficent results. By the X-ray picture, pulmonary tuberculosis is better detected, and heart disease can be more accurately learned from it than by percussion of the chest.

PROFESSOR ROENTGEN.

Rog'ers, Henry Wade, LL.D., American educator and legal authority, was born at Holland Patent, N. Y., Oct. 10, 1853, and educated at the University of Michigan, Ann Arbor. He studied law and, in 1877, was admitted to the bar, and later on became professor of law and dean of the law faculty in his alma mater. In 1890 he was appointed president of Northwestern university, resigning this position in 1900, and in 1901 accepting the chair of constitutional law at Yale. He has been chairman of many important bodies, especially those which have a bearing on legal education, jurisprudence, law reform, and on the foreign policy of the United States. He is the author of a work on *Expert Testimony*, on *Illinois Citations*, and for some years edited *The American Law Register.*

Rog'ers, John, American sculptor and modeler, was born at Salem, Mass., Oct. 30, 1829, and was educated at the Boston public schools. Early in life he became interested in clay-modeling, and in 1858 went to study art in Europe. Returning to the United States in 1859, he modeled a group, *The Checker-Players*, which attracted favorable attention; after this, he took scenes occurring in the Civil war as themes of his compositions; these were soon known as "Rogers' Groups," and well merited their popularity. The best known of these, some of which were reproduced in terra cotta, are the *Picket Guard*, and *One More Shot*, besides those of a social character, such as *The Favorite Scholar*, *Coming to the Parson*, *Going for the Cows*, *The Slave Auction*, etc. He has also produced a large equestrian statue of General Reynolds, which fronts the city hall, Philadelphia.

Rog'ers, Randolph, American sculptor, was born at Waterloo, N. Y., July 6, 1825, and after following mercantile pursuits for a number of years in early life, went to Rome to study the sculptor's art. Among the works for which he is distinguished are the designs for the Washington monument at Richmond, Va., a statue of John Adams in Mt. Auburn cemetery, a memorial monument for the state of Rhode Island at Providence, and a still larger one for the state of Michigan at Detroit, and the bronze statue of Abraham Lincoln at Philadelphia. He died at Rome, Jan. 15, 1892.

Rog'ers, Samuel, English poet, was born at the suburban village of Stoke-Newington, July 30, 1763. After obtaining a private education, he entered his father's bank in London at the age of seventeen, and in 1793 became the head of the firm. In 1792, appeared the poem on which his fame was chiefly based, *The Pleasures of Memory*, which in 1816 had reached a nineteenth edition. Then followed *An Epistle to a Friend* in 1798, *Voyage of Columbus* in 1812, *Jacqueline* in 1814, and *Italy* in 1822. Rogers was very rich; but his poetry, whatever may be its merits, is wholly a thing of the past—it is now but little read or quoted. He died at London, Dec. 18, 1855.

Ro'land, the hero of one of the most popular epic poems of Frankish literature, was, according to tradition, the nephew and favorite captain of the Emperor Charlemagne. All

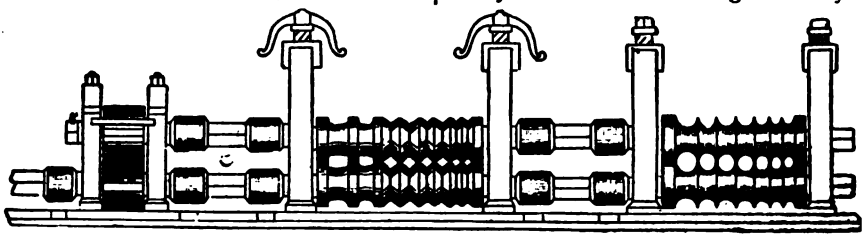
that history tells of him is, that when Charlemagne, in the year 778, was at Paderborn organizing the government of the Saxons, whom he had conquered, and attending to their formal admission into the Christian church, he was visited by a Saracen chief who offered to put the Frankish sovereign in possession of several towns south of the Pyrenees. Charlemagne at once accepted the offer and marched with a large army through Gascony, compelling its duke to do him homage, and took Pampelona and Saragossa. But on the return to France, Roland, who commanded the rear guard of the Christian army, was suddenly attacked by a large body of Gascons lying in ambush in the woods, and slain while fighting gallantly at the head of his troops. Throughout the middle ages the *Song of Roland* was the most popular of the many poems current; and William of Normandy, when on his way to conquer England, had it sung at the head of his troops to encourage them on their march. Even at the present day, the memory of Roland is still held in honor by the hardy mountaineers of the Pyrenees, among whose defiles the scene of his exploits is laid.

Roland (*rō-lon'*), **Madame Marie** (or Manon) **Jeanne Philipon,** was born at Paris, March 18, 1754. Her father had ruined himself by speculation, and her mother, an admirable woman, died shortly afterward; so her childhood was spent in poverty and loneliness, made the harder by her father's misconduct. At eleven, she spent a year at a convent and the next year with her grandmother. From a child she was a great reader, devouring all that came in her way, and the reading of Plutarch made her a republican. On her return to her father's house, she read Bossuet, Buffon, and Helvetius, and at length found her gospel in Rousseau. In February, 1780, she married Roland, who afterward became the leader of the Girondists. In 1791, in Paris, Madame Roland, with her masculine intellect and woman's heart, became the queen of a coterie of young and eloquent enthusiasts that included all the famous and ill-fated leaders of the Gironde, Brissot, Buzot, Petion, and at first even Robespierre and Danton. Her noble beauty, dark, expressive eyes, sweet voice, and eloquent words added a charm to patriotism that was irresistible. In March, 1792, Roland became minister of the interior, and three months later he was dismissed because he remonstrated with the king, who had refused to banish the priests. After the king's removal to the temple, Roland was recalled, but made himself hateful to the Jacobins by his protests against the September massacres, and took his part in the last ineffectual struggle of the Girondists to form a moderate party. On May 31, the sound of the tocsin announced the proscription of the twenty-two. Roland had been arrested, and while his wife went to protest against his imprisonment, he escaped, and fled to Rouen. She was seized, set at liberty two days later, and again arrested and taken to Sainte-Pélagie. She had five months of prison before death closed her tragedy of life, and during this time she wrote her unfinished *Mémoires*, furtively, with a swiftly flowing pen, on sheets of coarse, gray paper given her by a kind turnkey, often blotted by the falling tears. Her character, made perfect through suffering, took on a new refinement; she carried with her to death some of the sanctity of the martyr, and still, in Carlyle's phrase, like a white Grecian statue, serenely complete, she shines in that black wreck of things. She bore herself in prison with a gracious and queenly dignity, buried in her books, Thomson, Shaftesbury, Plutarch, and Tacitus. On Nov. 1, the morning of the execution of the twenty-two, she was transferred to the Conciergerie and lay there for eight days. She went to the tribunal dressed all in white, her long black hair hanging down to the girdle, and Nov. 8 (1793) she was carried to the guillotine along with a trembling printer, whom she asked the executioner to take first, to save the printer the horror of seeing her head fall. As she looked up at the statue of liberty, she exclaimed, "O Liberty, what crimes are committed in thy name!" A week later, her husband died by his own hand near Rouen, not willing to live longer in a world of crime. See Sainte-Beuve, in *Portraits of Women.*

Roll'ing Mills are machines which are rotated by steam-power and are used for manufacturing rods, bars, plates, beams, etc., of metal. The rolls are usually of cast iron, and are made in various forms according to the shape of the product. The cut shows rolls used for making square bars and round rods. Those used for making plates and sheets of metal are perfectly smooth, and are gradually brought together, as the metal is passed through, by means of the screws at the top. The picture shows a "train" of two rolls where the piece has to be brought back to the same side for each passage through the rolls, unless the machinery is reversed in direction each time. Trains of three rolls are frequently employed, so that the rolling takes place back and forth, first between the lower two, then between the upper two rolls. Steel, wrought iron, copper, and brass, as well as other metals and alloys, are frequently rolled. Usually the metal is rolled while hot, but certain products are finished by cold rolling in order that they may be harder and stiffer. All the steel and iron rails used for steam and electric roads, as well as the beams and bars used for buildings and bridges, are produced by rolling.

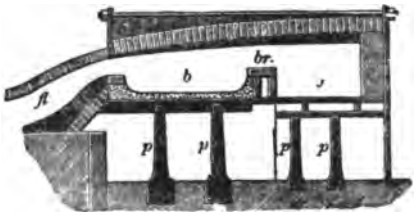
PUDDLING. Pig iron, the crude form of iron which is produced from iron ore by the process of smelting (see BLAST FURNACE), is changed to wrought iron, a metal that can be hammered,

rolled, and welded, by the process of puddling. This is an operation by which the carbon, silicon, sulphur, and other impurities are removed from the iron. The puddling furnace in which the process is conducted is shown in the figure, where *f* is the fireplace, *br* the bridge, *b* the bed, *fl* the flue, and *p p p p* the iron pillars supporting the furnace. When the fire is burning, the flame goes over the bridge, strikes the arched roof and reverberates down upon the iron, which is placed in the bed. When the roof, walls, and bed of



ROLLING MILL.

the furnace are moderately heated, the puddler "fettles" his furnace by plastering the bed and sides with a fettling composition, which consists of ground oxide of iron made into a paste with water. The crude iron is now thrown in, the fire is made up and the charge is heated. During the melting the puddlers stir the mass with a long iron rod. Presently the heated mass thickens, and solid granules are formed amid the liquid. These solid granules are squeezed together into a spongy mass or ball and rapidly carried to the hammer, where it is struck lightly at first and



PUDDLING FURNACE.

compressed into shape. During this beating or "shingling," liquid cinders are squeezed from the mass like water from a sponge. The puddled iron is then passed through rollers, by which further impurities are squeezed out, and the iron is formed into bars, plates, or thin sheets, as is desired for different purposes of manufacture. The puddling and rolling of iron was first practically introduced by Henry Cort, in England, in 1784, and since then many improvements have been introduced. Puddling has lost much of its importance since the introduction of mild steel, made by the Bessemer and open-hearth processes, which has largely taken the place of wrought iron.

Romagna (*ro-män'yä*), formerly the name of a region of Italy, forming the northern portion of the states of the church, and comprising the *delegations* of Bologna, Ravenna, Ferrara, and Forli. In 1861, these delegations became distinct provinces of the kingdom of Italy.

Ro'man Empire. To give an adequate history of this mighty nation from the founding of the city of Rome by Romulus, in the year 753 B. C., to the taking of Constantinople, in the year 1453 A. D., would require many volumes. Concerning the early settlement of Italy, it is impossible to form very definite conclusions; but we are at least warranted in affirming that at a very remote period a race emigrated from the east, embracing the ancestors of both Greeks and Italians, and Mommsen, the historian's statement that "the Italians, like the Indians, entered their peninsula from the north," may be regarded as certain. But in addition to the so-called Italian races, there settled in Italy in prehistoric times the Iapygians, the Etruscans, the Greeks, and the Gauls, and from the mingling of all these came the people of Rome. Recent investigations have shown the story of Romulus and Remus to be a mere myth; but it is probable the city was founded about the time when it is alleged they were suckled by a she-wolf. Perhaps the most rational view of the city's origin is that suggested by a consideration of its site. It was probably first built as a defense against the Etruscans, and as an emporium for the river traffic of the country; but whether it was founded by the Latin confederacy, or by the enterprise of an individual chief, is beyond our present knowledge or even conjecture. The motives which led to the founding of Rome also caused its rapid development, so that the beginnings of Roman history — if the ancient legend may be called history — are mainly records of the city's expansion and growth. An accurate history of the early Roman state is out of the question, as the traditions concerning the first four kings are too mythical to form the basis of sober narrative; but with the fifth king, Tarquinius Priscus, a marked change takes place, and we can at least feel that we are leaving the field of tradition, and approaching that of history. The expulsion of the younger Tarquin, about the year 509 B. C., in revenge for the outrage on Lucretia, marks the overthrow of the monarchy, and the establishment

of the republic, which continued during the next 500 years.

The history of Rome from the establishment of the republic to the abolition of the decemvirate, 449 B. C., was chiefly military, as the Romans were engaged in constant wars with their neighbors, especially the Etruscans. These conflicts continued down to the year 295 B. C., when the final victory over the Semnites and Etruscans ended the struggle and brought all Italy under Roman dominion. Having thus extended her power over Italy, it was but natural that Rome should become involved in wars with foreign nations; and in the year 264 B. C. began the terrible contest with Carthage, which comprised three separate wars, known as the three Punic wars, and which was closed only with the complete destruction of the latter city more than a century later. In connection with the Punic wars began the Macedonian wars — also three in number — which ended with the battle of Pydna, 168 B. C., in which the Macedonian empire was completely broken up. According to Polybius, the full establishment of the Roman empire was achieved at the battle of Pydna, as it was the last battle in which she was confronted by a civilized nation; all her subsequent wars were against rebellions of her own provinces or in contests with barbarians, as they were called. The subsequent history of the republic — the war with Jugurtha, the Servile wars, the civil wars of Marius and Sulla, the campaigns of Julius Cæsar, the civil wars between Cæsar and Pompey, and the final assumption of power by Octavius Cæsar, under the title of Augustus, has been given under appropriate heads, and need not be repeated here. When Augustus died, 14 A. D., the Roman empire was separated in the north from Germany by the Rhine; in the east the boundary line was the Euphrates; in the south Egypt, Libya, in fact, the whole of northern Africa as far west as Morocco, and as far inland as Fezzan and Sahara, acknowledged the Roman authority. The subsequent reigns of Tiberius, Caligula, Claudius, and Nero are little more than the record of conspiracies, assassinations, and acts of tyranny; but with the reign of Vespasian, 69 A. D., a better era commenced, which, if we except the reign of Domitian, continued for the next hundred years, and comprised the reigns of Titus, Nerva, Trajan, Hadrian, and Marcus Aurelius, the latter of whom, especially, was one of the wisest and most beneficent rulers the world has known. Nothing is clearer than the fact that after the time of Vespasian the worst days of Rome were over. Never again did she give way to the immorality and corruption of the first century.

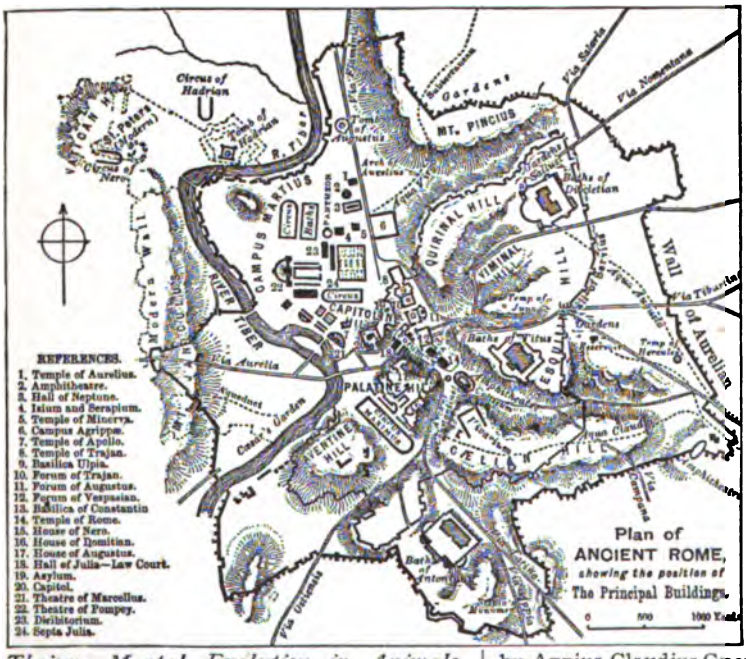
During the rule of Valerian, Gallienus, and the so-called Thirty Tyrants, the empire is a wild chaos, subject to inroads and invasions from barbarians; but with Claudius Gothicus its fortunes begin to brighten. By him and his successors Aurelian, Probus, and Carus, the barbarians of both the north and east were severely chastised, and when Diocletian became emperor, 284 A. D., it seemed as if the worst was over; but his division of the empire into east and west led to those civil wars, which were brought to a close by the commanding genius of Constantine. Under Constantine who reigned from 324 to 337 A. D., Christianity, which had hitherto been despised and persecuted, was established as the religion of the state and taken under the protection of the emperor. Constantine also transferred the seat of government from Rome to Byzantium, on the Bosporus, where he founded the city of Constantinople, naming it after himself. From the time of Constantine the political fortunes of Rome possess only a secondary interest, as it is the struggles of the Christian sects and the rise of the Catholic church that mainly occupy the attention of the historian. Christianity did not save Rome from destruction, but it enabled it to endure three centuries of barbarism. Julian's attempts to revive paganism were an utter failure, in spite of his abilities as a general, and the virtues of his personal character; and the year after his death, Valentinian was acknowledged as emperor by the army at Nicæa. In obedience to the wish of his soldiers, he conferred the title of Augustus upon his brother Valens, and the complete division of the empire was at last effected, Valentinian becoming emperor of the west, and Valens of the east. Valentinian, Gratian, and Theodosius the Great, were rulers worthy of better times; but they struggled against destiny, and their efforts were vain. Theodosius, indeed, subdued and even disarmed the Huns, by whom Rome was invaded; but immediately after his death they rose again under Alaric against Honorius, emperor of the west. Rome was saved for the time by the bravery and skill of Stilicho, the imperial general; but after his assassination the barbarians returned, sacked the city, and ravaged the entire peninsula.

The murder of Valentinian III. occurred in 455 A. D., and his widow Eudoxia, to be revenged on his murderer and successor Petronius Maximus, invited Genseric, "the scourge of God," over from Africa, thus exposing Rome to the horrors of pillage for several days. Ricimer, a Sueve, next figures as a sort of governor over the city, and the few relics of empire it still possessed; for Gaul, Britain, Spain, and Western Africa had all been wrested from it. Of the four emperors whom Ricimer placed on the throne, Majorian was the only one who had any of the qualifications of a ruler. Ricimer died in 472, and was succeeded in his functions by Orestes, the Pannonian, when Odoacer, in the year 476 A. D,, placing himself at the head of the barbarian mercenaries, overthrew the last emperor of the western empire, who,

by a curious coincidence, bore the same name as the mythical founder of the city — Romulus. This was the end of the western empire; but for nearly a thousand years thereafter the eastern empire, whose capital was at Constantinople, maintained its existence, in spite of all the enemies by which it was surrounded, until Constantinople was taken by Mohammed II., in the year 1453.

Romanes (*rō-măn'ēz*), Prof. **George John,** British biologist, author and lecturer, was born at Kingston, Ont., Canada, May 20, 1848, and died at Oxford, May 23, 1894. Educated at Cambridge, England, his taste for natural science led him to study, investigate, and write upon that branch of knowledge, and to lecture at the Royal institution, London, and later on at Oxford, on natural history, physiology, animal and plant life, etc. Making acquaintance with Darwin, he devoted much of his talent to the scientific exposition of evolution, taking ground adverse at first to the accepted Christian view of that doctrine, though finally expressing belief in the theistic position, and in opposition to the mechanical theories of the origin of things. His publications include, besides a number of articles on instinct, hybridism, and animal intelligence, *A Candid Examination of Theism*, *Mental Evolution in Animals*, *Mental Evolution in Man*, *Organic Evolution*, *Origin of the Human Faculty and the Philosophy of Natural History before and after Darwin*, a work on *Jelly-Fish, Star-Fish, and Sea-Urchins*, and an *Examination of Weismannism*, *Thoughts on Religion*, *Poems*, etc. See *Life and Letters of Romanes*, edited by his wife.

Rome. Modern Rome occupies the plain on each side of the Tiber (about fifteen miles from the mouth) and the slopes of the seven hills, the central one of which was the Palatine hill, whose summit is about 160 feet above the level of the sea. Romulus is said to have founded the city upon this hill, and upon its northwestern slope grew the sacred fig tree, under which he and his brother Remus were found sucking the she-wolf. Upon this hill were the temple of Jupiter Stator and other sacred buildings, besides many of the finest houses in Rome. Recent excavations have brought to light numerous remains of the palatial and other structures with which the Palatine hill was once covered, and these are now among the most interesting remains of the Eternal city. The settlement on the Palatine attributed to Romulus was fortified at a very early period, and in the time of the later or Etruscan kings at least five of the settlements on the seven hills had been surrounded by separate defenses. These fortified hills with the marshy hollows between them were then inclosed by a huge rampart or agger of earth. This agger formed the only defense of the city until the reign of Aurelian, a period of 800 years, and the great wall which bears the name of Aurelian is to a great extent identical with the present walls. To the period of the kings belongs the huge arched sewer which drains the marshy hollow between the Capitoline, Palatine, and Esquiline hills. In this valley was situated the Roman Forum, containing about two and one-half acres, which became at once the market and the place of political meeting for the various tribes who occupied the surrounding hills.



In the great aqueducts we have the most notable remains of the period of the republic. The oldest was that constructed by Appius Claudius Cæcus, in 312 B. C., which brought water from springs more than seven miles from the city. Other aqueducts were constructed during the imperial period. These aqueducts, fourteen in number, have an aggregate length of over 300 miles, and are among the most striking features of modern

Rome. Of the numerous temples in Rome, of which there are said to have been as many as three hundred, the names and sites of about one-half are known, the preservation of the few which remain being due to the fact of their having been converted into churches.

The Thermæ of Agrippa, of which the Pantheon is the only portion that remains, were the earliest of the great public baths for which imperial Rome was noted. On the low grounds at the south of the Cœlian hill were the baths of Caracalla, which were built to accommodate 1,600 bathers. The outer walls inclosed a space of nearly 27 acres, the baths themselves occupied nearly one-fourth of this space.

A large marshy plain, which now forms the most densely populated part of Rome, extended from the foot of the Capitoline and Quirinal hills to the Tiber, which, on account of its being used for military exercises, was called the Campus Martius. Here was erected the theatre of Pompey, which is said to have contained seats for 40,000 persons. Near by the capitol was the theatre of Marcellus, of which a considerable portion yet remains. This theatre was begun by Julius Cæsar and finished by Augustus in 11 B.C., who named it after his nephew Marcellus. The Flavian amphitheatre, known as the Colosseum, which was built for gladiatorial exhibitions and for the combats of wild beasts, was in the form of an ellipse, the longer diameter measuring a little over 600 feet, and the shorter a little over 500 feet. It rises to a height of 160 feet, and covers five acres of ground. The oldest circus was the Circus Maximus, in the valley between the Palatine and the Aventine hills, which was about three furlongs in length and one in breadth, and is said to have seated 250,000 persons. The arrangements of a Roman circus can best be studied in the well-preserved circus on the Appian Way, which usually bears the name of the Emperor Maxentius, but is more correctly assigned to his son Romulus. Of the twelve bridges over the Tiber, three are survivals of the eight or nine bridges of ancient times, the oldest being the *Pons Fabricius*, leading from the city to the island in the Tiber.

The population of the city in the time of Vespasian has been estimated at 2,000,000, while that of modern Rome, notwithstanding the great increase since it became the capital of Italy in 1870, is to-day (1901) only a little over 512,000. The walls, which inclose nearly 4,000 acres, are 14 miles in circumference, with 15 gates, two of which are closed. The largest palaces in Rome are the Vatican, the residence of the pope, and the Quirinal, now the residence of the king, but formerly a papal palace, in which were held the conclaves of cardinals for the election of popes. The chief papal collections are contained in the galleries attached to the Vatican, probably the largest palace in the world. In addition to the private gardens and apartments of the pope, the Vatican palace comprises large reception halls, with chapels, libraries, picture galleries, and vast museums of sculptures, ancient inscriptions, etc. The famous Vatican library, with its priceless manuscripts and its collections of early printed books, is contained in two immense halls.

The churches, said to be upward of 300 in number, are among the most conspicuous features of modern Rome. St. Peter's, the largest cathedral in the world, begun in 1506 and completed in 1626, covers 5 acres and cost $10,000,000. There are also the churches of the great religious orders, twenty-eight parish churches, and the titular churches of the cardinals. Before Rome became the capital of Italy in 1870, the greater part of the Pincian, Quirinal, and Esquiline hills was occupied by villas of nobles; but these have mostly been destroyed, and their sites covered with modern houses, and in many cases with blocks of buildings many stories in height, let out in tenements. The ancient city is assuming the aspect of a modern capital, broad, straight thoroughfares running through many quarters formerly occupied by narrow streets and mean, crowded houses. One of the greatest of improvements is the embankment of the Tiber and the straightening and deepening of its channel, which has put a stop to the disastrous floods, to which the lower parts of the city were formerly subject. All the necessaries of life have to be imported from a distance, as Rome is surrounded by the Campagna di Roma, a marshy plain which includes the greater part of ancient Latium, and which is, for the most part, an untilled and uninhabited waste, about 90 miles in length and from 20 to 40 miles in width. Corn and wine are brought from Tuscany and from the fertile Terra di Lavoro, near Naples. There are practically no manufactures in Rome; and the prosperity of the city depends mainly on the courts of the king and the pope, and on the foreign visitors who crowd the hotels during the winter months. The railways from all parts of Italy converge outside the city, which they enter near the Porta Maggiore on the Esquiline, and have a common terminus on the summit of the Quirinal.

Rome, the county seat of Floyd county, Ga., on the Coosa river, 61 miles northwest of Atlanta. It has iron foundries, manufactories of plows, nails, etc., and ships cotton. It is the seat of Shorter college. Population 7,291.

Rome, a city of New York, on the Mohawk river, 100 miles west of Albany, at the junction of the Erie and Black river canals. It contains a number of mills and manufactories of iron, brass, copper, and other goods. Here is Fort Stanwix, which was successfully defended against St. Leger, and six miles to the southeast the battle of Oriskany was fought during the Revolution. Population 15,343.

Rom'ulus, legendary founder and first king of Rome, son of Mars by Rhea Silvia, daughter of King Numitor of Alba Longa, was, so runs the myth, exposed along with his twin brother Remus at the foot of the Palatine hill, where he was suckled by a she-wolf, and afterward brought up by the shepherd Faustulus and his wife, Acca Laurentia. In 753 B. C., he founded his city on the Tiber, to which he invited all homeless fugitives in the surrounding country, who carried off Sabine maidens for their wives. After Romulus had firmly established his city, and secured peace between the Romans and Sabines, he was carried up to the heavens in a chariot of fire, and was later worshiped as Quirinus.

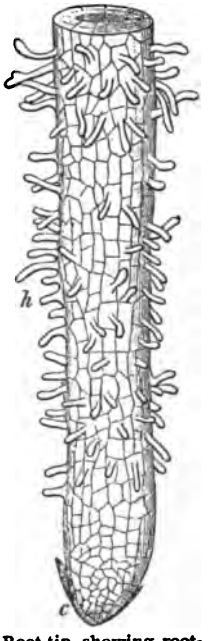
Rook, an Old World bird belonging to the crow family. It is slightly smaller than the common crow. Its plumage is purplish black with gray on the forehead and throat. The adults lose the feathers on the face, leaving a bare spot about the bill. These birds live in noisy flocks and nest near habitations. They are common in many parts of Europe and Asia, and in late autumn migrate to the east shore of Great Britain and return in the spring.

Roosevelt (*rō'ze-vĕlt*), **Theodore,** twenty-fifth President of the United States, was born at New York city, Oct. 27, 1858, and graduated from Harvard university in 1880. In 1882, he entered the New York state legislature, and at once rose to a commanding position as a Republican and reformer. In 1895, he was made president of the police commission of New York city and made his service notable by important reforms instituted. On the outbreak of the Spanish-American war, he was appointed assistant-secretary of the United States navy, but resigned after a few months' service, and organized the 1st United States cavalry volunteers, popularly known as Roosevelt's "Rough Riders," which he commanded, and with this body rendered distinguished service in Cuba, especially at the battle of Las Guasimas and at El Caney and San Juan hill. In 1898, he was elected governor of New York, and made his period of service notable for the personal integrity and political soundness which characterized his administration. In 1900, he was elected Vice-president of the United States, on the ticket with Mr. McKinley. In the campaign preceding the election he took a conspicuous part, discussing the important questions on which the election turned with marked ability and force. On the death of President McKinley, Mr. Roosevelt, who is a picturesque figure in American public life, became President of the United States, taking the oath of office at Buffalo, N. Y., Sept. 14th, 1901. Aside from his career as a public man, Mr. Roosevelt has made a mark as an author and man of letters; indeed, he at one time expected to make literature his life-work. His chief writings include *The Winning of the West*, *American Ideals*, *The Rough Riders*, *Life of Gouverneur Morris*, *Life of T. H. Benton*, *History of the Naval War of 1812*, *Life of Oliver Cromwell*, *The Wilderness Hunter*, and several books on ranch life and the hunting trail—*Hunting the Grizzly*, and *Hunting Trips of a Ranchman*.

THEODORE ROOSEVELT.

Root, George Frederick, an American musical composer, was born at Sheffield, Mass., Aug. 30, 1820, and after studying music a year in Paris, returned to write numerous popular songs, among which are *Music in the Air; Battle Cry of Freedom; Just before the Battle, Mother; Tramp, Tramp, Tramp, the Boys are Marching*. He has also produced a *Te Deum*, and other more pretentious pieces. He received the degree of a doctorate from Chicago university in 1872. He died Aug. 6, 1895.

Root. True roots are developed only by vascular plants, that is, by Pteridophytes (fern plants) and Spermatophytes (seed plants). They act either as holdfasts or as absorbing organs, or as both. The ordinary soil roots serve both for anchorage and for absorbing. In structure roots are all alike in general plan, whether they belong to ferns or pines, or to the true flowering plants. Each root consists of an epidermis, a more or less thick cortex, and a central, solid woody cylinder or axis. In the soil roots a peculiar cap of dead cells covers the delicate growing tip, known as the root-cap. This cap protects the delicate tip-cells as the root burrows through the soil, and it is renewed from beneath as fast as it is worn off on the outside. To aid roots in absorbing, the epidermal cells just behind the root-cap send out long hair-like processes known as "root-hairs," which immensely increase the absorbing surface. These root-hairs are very ephemeral, being present only near growing tips and rapidly disappearing from older parts. It is only the youngest roots which have this typical root-structure



Root-tip, showing root-cap (*c*) and young root-hairs (*h*).

and which do the work of absorption. As a root increases in age it becomes very much modified in its structure, and ceases to absorb, being then merely a channel through which the absorbed material passes to the stem and leaves. JOHN M. COULTER.

Root-cap. See ROOT.

Root-hair. See ROOT.

Root-pressure. When plants have their roots in a warm soil and the parts in air are not losing much water (whether because the leaves are not yet formed or because the moisture or coolness of the air do not permit evaporation), the roots may absorb water so rapidly (see ABSORPTION) that it distends the cells and escapes into the conducting tissues under the elastic pressure of the stretched cell walls. (See TURGOR.) By this pressure it may be driven through the conducting tissues to some distance above the ground, and may well out at a wound. Late-pruned grape vines "bleed" in this way, and much of the so-called dew on a lawn is water which has exuded from the leaves on account of root-pressure. Many leaves have special openings (water pores) which permit the escape of water at times. But when evaporation is rapid, root-pressure falls to zero or becomes negative; therefore while it may assist in supplying water to leaves, it fails when the need is the greatest, and cannot be an important agent in the ascent of water. See WATER, ASCENT OF.

Root'stock, an underground stem, usually horizontal and much thickened by the storage of reserve food. That the structure is a stem may be recognized by the fact that it often bears reduced leaves. It is really the primary shoot of the plant, and sends out its branches or leaves above ground. An equivalent word is "rhizome."

Root-tubercles (*tū'bĕr-k'ls*). On the roots of many leguminous plants, as the clovers, little wart-like outgrowths frequently occur, and are known as "root-tubercles." It is evident that these tubercles are occupied by certain bacteria, which swarm in them and which are doubtless obtaining food from the roots of the host. These bacteria have the peculiar power of laying hold of the free nitrogen of the air circulating in the soil, and of supplying it to the plant in some usable form. This habit of clover and its allies explains why they are useful in what is called "restoring soil." After ordinary crops have exhausted the soil of its usable nitrogen salts, and it has become relatively sterile, clover is able to grow by obtaining nitrogen from the air by the root-tubercles. If the crop of clover be plowed under, the nitrogenous material thus organized is contributed to the soil, which is thus restored to a condition which will support the ordinary crops again.

Ropes are usually made of vegetable fibers, and differ from twine only in their greater thickness. The fiber in most constant use is hemp, although ropes are also made of manilla or wild plantain, and of wire. Coir fiber from the husk of the cocoanut is another important rope-making material, which has the advantage of being lighter than either hemp or manilla. Sisal hemp from South America is also used to a considerable extent, especially for ropes of small size, and for many purposes cotton ropes are also employed. Notwithstanding the extensive use of machinery in the manufacture of ropes the old process of rope-walk spinning is still practiced on a considerable scale. The successive stages in this process are: (1) hackling the fiber; (2) spinning the yarn; (3) tarring in "hauls," consisting of about 300 yarns; (4) winding the yarn on bobbins and mounting these on bobbin frames; (5) forming the strands; (6) laying the strands into a rope. As life and property depend to so great an extent on the efficiency of ropes great care and ingenuity have been exercised in their manufacture, causing many improvements to be devised for increasing their strength. Among these is the introduction of wire ropes, which are now extensively used in rigging ships and for other purposes. These are generally made of iron wire, sometimes but not always galvanized. The twisting is done in the same way in which the strands of a hempen rope are laid together.

Rose. The well-known name of the genus *Rosa* and the type of a great family of plants. It is one of the most prized of the cultivated

ROSE.

ornamental forms, and is distributed over the whole temperate and sub-alpine region of the northern hemisphere. Over 200 species have been described, only about 15 or 20 of which occur native to North America. The varieties in cultivation are almost innumerable, both those which are hardy and those adapted for culture under glass.

Rose'bery, Archibald Philip Primrose (Earl of), was born at London, May 7, 1847,

and after being educated at Oxford, succeeded his grandfather as fifth earl in 1868. In 1874, he was chosen president of the Social Science congress, and in 1880 was elected lord rector of Edinburgh university. On public platforms throughout the country Lord Rosebery is welcomed as an effective and entertaining speaker, and, although a peer of the realm, enjoys in an unusual measure the good-will of the whole of the democracy. In 1886, Lord Rosebery became secretary for foreign affairs in Mr. Gladstone's cabinet. In 1894–95, he was prime minister. He is a strong imperialist, though a Liberal in politics. He has published an interesting study of *Napoleon Bonaparte.*

Rosecrans (*rō'ze-krănz*), **William Starke,** an American general, was born at Kingston, Delaware county, O., Sept. 6, 1819, and after graduating at West Point, in 1842, served in the army as an engineer until 1854, when he resigned and afterward engaged in coal mining and the manufacture of kerosene. Being commissioned brigadier-general of volunteers, in 1861, he rendered efficient service in McClellan's West Virginia campaign of that year, and when the latter was appointed commander of the army of the Potomac, Rosecrans was left in command in West Virginia. After the evacuation of Corinth by the Confederates, in 1862, he was placed in command of the army of the Mississippi; and in this capacity defeated Gen. Sterling Price at Iuka on the 19th of September, and a few days later successfully defended Corinth against Price and Van Dorn. He was then made commander of the army of the Cumberland; and on the first and second days of January, 1863, fought the battle of Stone River, Tennessee, in which his army won a substantial victory, although it was with great loss; but at Chickamauga, in the following September, he was defeated by Bragg, with a loss of over 16,000 men, the army being saved from complete destruction by the heroic valor of Gen. George H. Thomas. Rosecrans was superseded by General Grant a short time after this battle, but in 1864 was placed over the department of Missouri, and repelled Price's invasion of that state. He resigned his position in the army in 1867, and was appointed minister to Mexico by President Johnson in 1868, and was a member of congress from California from 1881 to 1885. In the latter year he was appointed registrar of the United States treasury by President Cleveland. He died near Los Angeles, Cal., March 11, 1898.

Ro'ses, Wars of the, a struggle between the houses of York (White Rose) and Lancaster (Red Rose), which desolated England from the first battle of St. Albans, in 1455, to the battle of Bosworth in 1485. The house of Lancaster first came to the throne when Henry IV., son of John of Gaunt, compelled his cousin, Richard II., to resign the crown in his favor in 1399. Henry IV. was succeeded by his son Henry V., in 1413, and he by his son Henry VI., in 1422; but during the reign of the latter, Richard, duke of York, and son of John of Gaunt, began to advance his claim to the throne. In 1454, Richard was appointed protector of the realm during Henry's insanity, and on the king's recovery soon after took up arms against his rival Somerset, and defeated and crushed him at the battle of St. Albans. But such was the weakness of Henry's administration and such the unpopularity of his queen (Margaret of Anjou), that the earls of Salisbury, Warwick, and March rose against him, defeating and capturing him at Northampton in 1460. The active and ambitious queen now passed swiftly to the north, and in the battle of Wakefield the duke of York was defeated and slain; but his son Edward gained decisive victories over the queen's forces at Mortimer's Cross and Towton (1461), after which he was crowned king at Westminster as Edward IV. A few years after Edward became king, the earl of Warwick, who had been one of his most active adherents, took offense at his marriage with Elizabeth Woodville and formed an alliance with Queen Margaret, on account of which Edward was compelled to leave England for a time, and Henry VI. was once more invested with the royal authority. But Edward returned in 1471, defeated and slew Warwick at Barnet, and defeated the queen at Tewkesbury. The murder of Prince Edward, Henry's son, after the battle, and the death of Henry himself in the Tower (1471) left Edward to reign in peace until 1483, when he died and was succeeded by his son Edward V., the unfortunate prince who, with his brother Arthur, was murdered in the Tower by order of his uncle Richard III. Richard's reign, however, was a short one, as he was defeated and slain at the battle of Bosworth, in 1485, by the earl of Richmond, who then became King Henry VII.

Roset'ta Stone, a slab of black basalt (now in the British museum), found by some French engineers, in 1799, near Rosetta, a town on the delta of the Nile, and famous as having furnished the first key for the interpretation of Egyptian hieroglyphics. Despite its present mutilated appearance, it has been judged that the slab was erected in honor of one of the Ptolemies, in 196 B. C. On it are carved three equivalent inscriptions—the first in hieroglyphics (or picture writing of a sacred character), the second in demotic (enchorial or epistolographic) characters, and the third in uncial Greek letters. The mutilations have destroyed a considerable portion of the inscriptions. In its present broken condition, the stone measures three feet nine inches in height, two feet four and one-half inches in width, and eleven inches in thickness.

Ros'lin, a Midlothian Scottish village, near the wooded glen of the North Esk, seven miles south of Edinburgh. Its castle was the seat of the St. Clairs, earls of Orkney from 1379 to 1471, and afterward of Caithness, and hereditary grandmaster masons of Scotland from 1471 to 1736. The exquisite "chapel," built about 1446, was much damaged by an Edinburgh mob in 1688, but was restored by the third earl of Rosslyn at a cost of $25,000, and since 1862 it has been used as an Episcopal church. On Roslin Moor, the Scots are said to have twice defeated the English in one day — Feb. 24, 1303.

Ross, Sir **James Clark,** British navigator, and nephew of Sir John Ross, Arctic explorer, was born at London, April 15, 1800, and died near Aylesbury, England, April 3, 1862. Entering the navy in 1812, he accompanied his uncle on his first voyage in search of a northwest passage; he also accompanied Captain Parry in similar expeditions during the years 1819 and 1827. In the latter he was appointed commander, when he once more traversed the Arctic seas under his uncle, and in June, 1831, has the credit of discovering the position of the north magnetic pole. In the thirties and forties, we find him in command of the *Erebus*, which, with the *Terror*, roamed the Antarctic seas, and reached the furthest southern latitude hitherto explored (78° 10′ S.). On this voyage the Erebus was discovered and named, the volcano having a height of 13,000 feet. Subsequently he was honored with a knighthood, and published *A Narrative of a Voyage in Southern and Antarctic Regions*, 1839–47.

Ross, Sir **John,** British navigator and Arctic explorer, was born in Scotland June 24, 1777, the son of the minister of Inch, Wigtownshire, Scotland, and was little more than nine years old when he entered the navy, serving with distinction in the French wars. His most important services were rendered in the Arctic regions, in 1818, as second in command under Commander Parry, the object of the expedition being to explore Baffin bay and attempt a northwest passage. In 1829, he commanded an expedition to the Arctic regions, fitted out by Sir Felix Booth, and discovered the peninsula of Boothia Felix. In 1850, he made yet another voyage to the polar regions — an unsuccessful attempt to find Sir John Franklin. He died at London, Aug. 30, 1856.

Rossetti (*ros-sĕt'tē*), **Christina Georgina,** a prominent modern English poetess, sister of Dante Gabriel Rossetti, was born at London, Dec. 5, 1830, and died Dec. 29, 1894. She was of Italian origin, daughter of Gabriele Rossetti, a well-known commentator on Dante, and began early to write verse. Her mood was religious and reflective, though inclined somewhat to mysticism, and she had a woman's soulfulness, insight, and grace. Her chief productions are, *The Prince's Progress, Goblin Market and Other Poems*, with a volume of children's stories, entitled *Speaking Likenesses*, and a collection of nursery rhymes, entitled *Sing-Song*, etc. See *Memoir*, by Ellen A. Proctor, edited by W. M. Rossetti.

Rossetti (*ros-set'ē*), **Gabriele,** a celebrated Italian author, was born at Vasto, in the kingdom of Naples, Feb. 28, 1783, and at an early age was placed by the Marchese del Vasto to study in the University of Naples. The boyhood and youth of Rossetti were passed in a time of great political commotion; and in 1824 he went to London as a political refugee. In that city he lived a quiet and studious life. Among his works was a commentary on Dante, in which he tried to show that the works of that great poet were antipapal in their hidden meaning, and that Beatrice was a symbolic personage, not a real woman. Rossetti's views in reference to Dante excited a great deal of controversy, which has not yet entirely ceased. His memory is much revered in Italy, especially in his native town, where the house of his birth has been purchased as public property, and a theatre and the chief public square have been named after him. He died at London, April 26, 1854. His son Dante Gabriel and his daughter Christina also won wide fame, the former as a painter and poet, and the latter as an author.

Rossini (*ros-sē'nē*), **Gioacchino,** a great Italian operatic composer, was born at Pesaro, on the Adriatic, Feb. 29, 1792. At the age of fifteen he was sent to study at the Lyceum of Bologna. Passing over a number of juvenile efforts, his first important opera was *Tancredi*, which was brought out in 1813, and immediately raised him to the summit of honor and fame. In 1823, he produced *Semiramide*, the most gorgeous of his operas, in Venice, after which he visited Paris and London, at both of which places he was received with the greatest enthusiasm. Being appointed director of the Italian opera in Paris, in the year 1829 he produced his greatest work, *William Tell*, which was conceived and written in a style very different from his Italian operas, and more conformable to modern dramatic ideas. With the exception of his well-known *Stabat Mater*, he may be said to have closed his career with *William Tell*, large offers from the managers of opera houses failing to draw him from his retirement. He died at Paris, Nov. 13, 1868. See biography, by H. S. Edwards, and *Life*, in the "Great Musician" series, by the same author.

Rossiter (*ros'i-ter*), **Thomas P.,** American painter, was born at New Haven, Conn., Sept. 29, 1817, and began the practice of his art in that city in 1838. In 1840, he sailed for Europe, and after spending a year or more at Paris, he opened a studio in Rome, where he worked for several years. He returned to

America in 1846, and opened a studio at New York, where he painted a number of large scriptural pictures. He attended the Paris exposition in 1856, at which he won a gold medal; and after his return to the United States, spent three or four more years in New York city, and then removed to Cold Spring, N. Y., where he died May 17, 1871, his later years being employed on a series of paintings representing various scenes in the life of Christ.

Rothschilds (*roths'childs*), the well-known family of bankers, take their name from the sign of the house ("Zum rothen Schilde," or "Red Shield"), in the Jews' quarter of Frankfort, in which their ancestors lived. The founder of the great banking-house was Mayer Anselm Rothschild, who was born in 1743, and died in 1812. Although educated for a Jewish rabbi, he began his career in the banking business at Frankfort, and so won the confidence of the landgrave of Hesse, that he was intrusted with the management of that prince's finances. The story is current that he hid the treasures of the landgrave, amounting to more than $5,000,000, from the French invaders of 1806, and was allowed the free use of the money for several years, thereby laying the foundations of his great fortune. Whether this be true or not, his business soon immensely prospered, and the house became a financial power that was felt by all the governments of Europe. Previous to the senior Rothschild's death, he saw his five sons established as financial kings in the principal capitals of Europe — Anselm in Frankfort, Nathan in London, Solomon in Vienna, James in Paris, and Charles in Naples. Nathan is said to have known the result of the battle of Waterloo several hours before the English government, and the knowledge was worth $1,000,000 to him. He was succeeded by his son Lionel, who distinguished himself by his efforts to secure the removal of the civil disabilities to which the Jews were formerly subject in England. See *The Rothschilds*, by Reeves.

Rotifers (*rō'ti-fērs*), a class of minute worms abundant in fresh water. They are also found in damp moss and in the sea. They are often called wheel-animalcules, on account of the wheel-like appearance presented by the rapid movement of cilia on the front part of their bodies. The movement of these cilia produces a minute whirlpool in the water, in which the particles of food are conveyed to the animal's mouth. Although so minute, and presenting a general resemblance to Infusoria (which see), they are, nevertheless, many-celled animals of complicated construction. They have a nervous system and other sets of organs distinctly developed. They are favorite objects with amateur microscopists. See Gosse's *Evenings with the Microscope*.

Rotterdam (*rot'er-dam*), the busiest port of Holland, stands on both sides of the Maas river, twenty miles from its mouth, and forty-five miles from Amsterdam. The trade of Rotterdam has grown very rapidly, ever since Holland was separated from Belgium, especially since the middle of the century. In 1888, the quays measured fifteen miles in length, and the docks covered an area of nearly 200 acres, and since then two new docks have been constructed, and the wharves have been extended. More than fifty per cent. of the vessels that enter the various ports of Holland (estimated by their tonnage) enter at Rotterdam. The total tonnage of vessels entering Rotterdam yearly amounts to over 9,000,000 tons. From this port from 5,000 to 15,000 emigrants sail yearly to the United States and other countries. Rotterdam counts among her famous sons Erasmus, the poet Tollens, and James, duke of Monmouth. Population 319,866.

Rouen (*rōon'*), formerly the capital of Normandy, and after Lyons the chief manufacturing city of France, is situated on the right bank of the Seine, 90 miles from Paris by rail. The modern streets are well and regularly built; but a considerable part of old Rouen still remains. The Seine river makes Rouen, although 80 miles from the sea, the fourth shipping port of France, and extensive improvements in the way of deepening the river and building wharves are yearly adding to its capacity and importance. William the Conqueror died at Rouen in 1087. During the wars of Henry V. and Henry VI. of England, it was subject to the English from 1419 to 1449, when it was retaken by the French under Charles VI. It was during its occupation by the English that Joan of Arc was burned alive in the square of the city in which stands her statue. Population 113,219.

Rouma'nia or **Ruma'nia**, an independent kingdom of southeastern Europe, composed of the two former principalities of Wallachia and Moldavia, situated between 22° and 30° east longitude and 43° and 49° north latitude. It is bounded on the west and north by Austria, on the east by Russia and the Black sea, and on the south by Bulgaria, from which it is separated by the Danube river. Its area is about 50,700 square miles, and its population 5,912,000. The capital of Rumania is Bucharest, in Wallachia (population 282,071), and the chief town of Moldavia is Jassy (population 78,067), not far from the river Pruth. A remarkable feature in the agricultural system of Rumania is the ownership of lands by the peasantry, which was introduced about the year 1864. The peasants had been robbed of their lands during long ages of feudal oppression, and at this time it was determined to restore a portion by permitting them to purchase small tracts by means of a loan from the government. The result was that in 1880

there were in Rumania nearly 500,000 holdings, averaging 10½ acres each, with the greater part of the debt discharged by the owners. In 1859, the two principalities elected Prince Conza as their ruler until 1866, when he was deposed and was succeeded by Prince Charles of Hohenzollern. In 1881, Prince Charles was invested with the kingly dignity with the consent of the European powers, and since that time the Rumanians have practically freed themselves from both Russian and Turkish interference, and have taken their place among the independent nations of Europe. See *Rumania, Past and Present*, by Samuelson.

Roume'lia or **Rume'lia** (Turkish *Rum Ili*, meaning "land of the Romans"), a name used to denote an important portion of European Turkey, differing widely in area in different times, but most generally applied to the region between the Balkan mountains and the Ægean sea, corresponding to the ancient Thrace and part of Macedonia.

Round Table, The, a table, according to Arthurian tradition, designed by Merlin, a Welsh sage and enchanter of the 5th century, for Uther Pendragon, a British king, to seat fifty knights at feasts. According to the legend, these knights were to be distinguished for piety, courage, and fidelity; they formed originally a military order, known as "the Knights of the Round Table," but the organization became also a theocratic one. As they gathered round the table, the seat was reserved (styled the seat perilous) for the knight of their number, or who was afterward to appear, whose achievement of the Holy Grail was certain. In due time the vacant seat was filled by the Arthur of romance, a brave, virtuous, and accomplished knight, whose exploits fill all the poetry of the middle ages. He was the son of Uther Pendragon by Igerna, and was educated and instructed by Merlin, who figures in Spenser's *Faërie Queen*, in the tales and romances of mediæval chivalry, and in Tennyson's *Idylls of the King*. Arthur woos and weds Guinevere and makes her his queen; he has, however, to wage war for her with Sir Lancelot (son of the king of Brittany, and one of the knights of the Round Table). Much of the legend of this knight (who was father of Sir Galahad by Elaine) has to do with his (Lancelot's) guilty love for Guinevere, and with the exploits he performed in her service. The Round Table is fabled to have been constructed in imitation of the one which Joseph of Arimathea established in imitation of that used at the Last Supper. According to another tradition, Arthur himself established the Round Table at York, and founded at Winchester his order of knighthood.

Rousseau (*rō-sō'*), **Jean Baptiste,** a great lyric poet of France, was born at Paris, April 16, 1670, the son of a shoemaker. When quite young he began writing pieces for the theatre which were unsuccessful. In 1712, he was banished from France for failing to make good a charge of libel brought against a fellow writer, and spent the remainder of his life abroad, a part of the time in Switzerland. At Brussels, he became acquainted with Voltaire, who was first his friend and then his enemy. His sacred odes and songs, and especially his epigrams, took high rank. Rousseau died at Brussels, March 17, 1741.

Rousseau', Jean Jacques, a noted Swiss-French philosopher, was born at Geneva, June 28, 1712. His mother died at his birth, and in 1722 his father fled from the city to escape imprisonment for engaging in a brawl. His uncle then apprenticed him to a notary. After being sent home as a fool, he was apprenticed to an engraver, but having rambled one night outside the city walls till the gates were closed, he was afraid to face his master and set out to seek his fortune. For a while he stayed with a priest of Savoy who tried to make him a Catholic — he was of an old French Protestant family — and was prevailed upon to be baptized by Madame de Warens of Annecy, to whose home he returned after serving for a time as footman, lackey, and private secretary. For nearly nine years Rousseau was her friend and pupil, calling her his "maman," reading to her, and helping her to manage her estate.

In 1741, he set out to make his fortune at Paris. Here he lived in a dirty, shabby inn, earning a livelihood copying music. Here he met Thérèse le Vasseur, who lived with him the remainder of his life. He wrote for Diderot's *Encyclopedia*, but first came into notice through his *Discourse on Arts and Sciences*, which won him a prize. His independence of thought and the freshness of his brilliant style made him celebrated and welcome in society. In 1753, he brought out a successful opera, full of sparkling airs, one of which is the well-known hymn tune, *Rousseau's Dream*. In 1760, his romance, *The New Hélöise*, was at once received with applause. Two years later, came out the *Social Contract* and *Émile*. The first of these three works raised Rousseau to the first rank as a writer of romance; the second, as a political socialist; the third, as a writer on education. His *New Hélöise*, by its passion, influenced the society and literature of France, Italy, and Germany, and by its idyllic pictures and fine descriptions touched the fashionable world with a love for country life and simple ways; while the whole book was a lesson on the rights of the poor and the duties of the rich. The *Social Contract* taught that no laws are binding unless agreed upon by all the people, and Rousseau's "liberty, equality, and fraternity" became a war-cry of the French revolution. His ideas on children's training, set forth in *Émile*, were used by great teachers like Froebel and Pestalozzi, but in a part of the book he showed himself a deist in religion,

and horrified the church, as much as he disgusted such men as Voltaire and D'Alembert. The state did not like his views on kings and government any more than the church did his views on religion. So he was denounced by the archbishop of Paris, his book burned, and himself ordered under arrest. He fled the country, living for a while in Neuchatel, where he made lace, went botanizing, and wrote his *Letters from the Mountain*. For a while he was given a home by the historian Hume in England, where he wrote his famous *Confessions*. His trials and broken health had made him senselessly suspicious. He distrusted his best friends, was sure the English government sought his life, and that he was everywhere dogged by spies. So he soon went back to France, living in various places provided by his friends, and wrote his *Reveries*. His delusions increased, so that he even asked for shelter in a hospital; everywhere he felt that he was watched by spies, and hated even by the children on the streets. He died near Paris, July 2, 1778. See Morley's *Memoir*.

Rousseau', Lovell Harrison, American soldier, was born in Kentucky, Aug. 4, 1818. He fought in the Mexican war under General Taylor, and on his return practiced law in Louisville. In the Kentucky senate, during 1860, he opposed the idea of secession and later raised two regiments of Union men. In 1861, as brigadier-general, he fought in Buell's army at the battle of Shiloh, April 7, 1862. He was in the battle of Perryville, Ky., Oct. 8, and at Murfreesboro Dec. 31, of the same year, and for gallantry was promoted to the rank of major-general. In November, 1863, he was appointed to command the district of Tennessee, which position he resigned two years later. When Alaska was purchased, in 1867, he was assigned there as brigadier-general in the regular army, and in the year following was transferred to the command of the department of Louisiana. He died at New Orleans, Jan. 7, 1869.

Rousseau', (*rō-sō'*) **Pierre Etienne T.,** a prominent landscape painter of France, was born at Paris, April 15, 1812, the son of a tailor. A kinsman, who was himself a painter, saw a landscape the boy had painted when fourteen years old, and persuaded his parents to have him study art instead of engineering, as they had intended. However his best teachers were not the artists to whom he was sent, but the old masters in the Louvre, while his happiest hours were spent in sketching from nature in the country around Paris. Some of his best pictures were rejected by the Salon, and for many years he struggled against neglect and discouragement. But later his worth was acknowledged, and he was made an officer of the legion of honor. Among his best landscapes are, *The Alley of Chestnut Trees* and *Early Summer Morning*. He died near Fontainebleau, Dec. 22, 1867. See D. C. Thompson's *The Barbizon School*.

Rowan Tree (*rō'an*). See MOUNTAIN ASH.

Row'land, Henry Augustus, easily first among American physicists, was born at Honesdale, Pa., on Nov. 27, 1848, and died at Baltimore, Md., April 16, 1901. He received his education — if we may speak of such a genius as having "received" anything at all in the way of education, other than what he worked out for himself — at the Rensselaer Polytechnic institute in Troy, where he graduated with the degree of civil engineer in 1870. During a short while, 1871–72, he "taught science" at Wooster college in Ohio. From 1872–75, he taught physics at his alma mater in Troy. During these three years he prepared a very important paper on some problems in magnetism which at once gave him a reputation in Europe. In 1872, he was selected by President Gilman as one of the original staff of Johns Hopkins university. He was immediately given a year's leave of absence, however, and in 1876 at Helmholtz's laboratory in Berlin, he made one of the most important electrical discoveries of modern times, namely, that electric charges when put into rapid motion exert magnetic forces just as do the equivalent electric currents. The story of his work during the next quarter century at Johns Hopkins university is too long for recital here. Suffice it to say that within a few years his researches on the mechanical equivalent of heat, on the value of the absolute unit of electrical resistance, on the diffraction grating, on the spectra of the elements, and on the solar spectrum won distinction and honor for him from all the more important learned societies of the world. Among his greatest discoveries must be mentioned the curved rating which is the essential part of the most powerful form of spectroscope known, and one which does not involve in its construction any lenses. His printing multiplex telegraph, on which he was at work at the time of his death, formed one of the most interesting exhibits at the Paris exposition and has recently been adopted by the German government.

President Gilman says of him: "He knew how to ask a difficult and far-reaching question, and he knew how to seek the answer. Extraneous considerations were excluded when he saw the point of an inquiry, and on that point he concentrated all his powers. For example, when he began the brilliant series of experiments in spectrography, which made him peerless in this domain, he saw that the spectrum depended on the accuracy of the gratings, and the gratings on the dividing engine, and the dividing engine on the screw, so he began the study of light by devising and making a screw more exact than any screw that has ever been produced by the most accomplished makers of instruments of precision." For details of his work, see sketch

by Professor Ames, in *Astrophysical Journal*, May, 1901; and also one by Prof. H. F. Reid, in *American Journal of Science*, June, 1901.

Ru'bens, Peter Paul, a celebrated painter of the Flemish school, was born at Siegen, in Westphalia, June 29, 1577. In 1579, his father, who was a lawyer, died, and his mother went back to her native city of Antwerp, where young Rubens was taught at a Jesuit school. For a while he served as a page, but at thirteen began to study art. In 1600, he went to Italy, studied the works of Titian and Paul Veronese, and became court painter to the Duke of Mantua. In 1605, he was sent on a mission to Philip III. of Spain and proved a good diplomat. While at Madrid he painted the portraits of many of the nobility. He settled at Antwerp in 1609, and became court painter to the Archduke Albert. The same year he married his first wife, Isabella Brant, whose likeness he so often painted. Between 1611 and 1614, he painted his *Descent from the Cross*, which is usually thought to be his masterpiece. At Paris, he painted over a score of pictures for the queen mother, Marie de Medici, illustrating her marriage with Henry IV. Sent on a mission to Philip IV. of Spain, he stayed nine months in Madrid, became acquainted with Velasquez, and painted some forty pictures, among them five portraits of the king. He was also sent as envoy to Charles I. of England, to treat for peace. He accomplished his mission with great tact, and painted the portraits of the king and queen, as well as other English pictures. He was knighted by both Charles I. and Philip IV. In 1630, Rubens married his second wife, Helena Fourment, a beautiful girl of sixteen. The main features of Rubens' work were power, spirit, and life. Reynolds said: "Rubens was perhaps the greatest master in the mechanical part of the art; the best workman with his tools that ever used a pencil." In all, Rubens painted several thousand pictures. He died at Antwerp, May 30, 1640. See C. W. Kett's *Great Artists*.

Rubicon (*rō'bi-kon*), a stream of central Italy, falling into the Adriatic, became famous from Cæsar's passage of it in the middle of January, 49 B. C., on his march on Rome. It formed the southern boundary of his province, so that by crossing it he really declared war on the republic. It is said that Cæsar hesitated awhile on the bank and then crossed with the words, *Jacta est alea* (the die is cast). So "crossing the Rubicon" has come to be a proverb with reference to any decisive step.

Rubinstein (*rō'bin-stīn*), **Anton Gregor,** Russian composer and pianist, was born near Jassy, Rumania, Nov. 30, 1829, and died near St. Petersburg, Nov. 20, 1894. Early in life he became a pupil of Abbé Liszt at Paris, after which he gave a number of notable concert tours, and by his compositions and playing created a sensation. In 1858, he became director of the Russian imperial concert and later founded the St. Petersburg Conservatory of Music. He visited England and France a number of times, as well as the United States. His compositions have a lyric melodiousness and are characterized by much feeling and sweetness. He held deserved high rank as a pianist, having a mastery of technique and manifesting great musical sensibility. He wrote about 20 operas, besides a number of overtures, sonatos, concertos, symphonies, and vocal pieces. In 1887, he was awarded the French decoration of the Legion of Honor, and in 1889 received a grand jubilee *fête* at St. Petersburg. In 1890, appeared an *Autobiography* of the great pianist, and later on a *Conversation on Music* came from his pen.

Rou'ble or **Ru'ble,** a Russian coin, weighing in silver about 20 grams, and equivalent to 100 kopecks. It is the legal unit of money throughout Russia, and is worth about 50 cents, or 2 shillings English. Officially 9.47 roubles are equivalent to $5 gold or to the pound sterling. In the Czar's dominions, gold is coined into 10 and 5 rouble pieces equal to $5.30 (£1. 1.4*d*. and $2.65 (10*s*. 8*d*. sterling). Besides the silver and gold roubles, credit notes (paper money) are legal tender of the denomination of 100, 25, 10, 5, 3, and 1 rouble.

Ru'by, a much prized gem, is a pure, transparent, red-colored variety of the mineral corundum, sapphire being a blue variety of the same mineral. Corundum, which is aluminum oxide, forms the hardest of all gems except the diamond. Although usually red, yet pink, purple, and violet rubies are found, but the most valuable are those of the color called pigeon's blood. The finest eastern rubies are more highly prized than diamonds of like size and quality. Those over a carat in weight are worth from $100 to $1,000 a carat, and no stone increases so much in value as it increases in size. But rubies perfect in color, transparency, and freedom from flaw are much rarer than good diamonds. Rubies seldom weigh more that eight or ten carats, but Gustavus III., of Sweden, presented one to Catharine of Russia as big as a pigeon's egg. One owned by the king of Ceylon was, according to Marco Polo, a span long, as thick as a man's arm, and without a flaw; Kublai Khan vainly offered a city for it. The finest rubies come from Upper Burma. Dark-red rubies are found in Siam and purplish rubies in Ceylon. Rubies are also found in the mountain region of Yunnan in China, in Afghanistan, and in the basin of the Oxus river. They have also been found in New Guinea, Victoria, and New South Wales. Many of the so-called rubies of jewelers are varieties of spinel, a mineral softer than corundum, and mostly made up of

alumina and magnesia. Artificial rubies are now made which are used in watches, and for this purpose are equal to natural rubies. Although they are identical in composition and hardness with the natural stones, their use as gems is considered fraudulent. They may usually be detected by microscopic examination, since they generally contain minute bubbles.

Ruff, a bird allied to the sandpiper. It breeds in the north of Asia and Europe, and migrates southward as far as the Cape of Good Hope. It is found as a straggler in Iceland, in Canada, and in some of the eastern states, and is sometimes shot on Long Island. The male bird, the ruff, is about a foot long. In the spring it sheds the feathers of the face; curled tufts of feathers appear on the sides of the head, and an erectile ruff grows which lasts two months. The ruff, as well as the feathers of the back, show every variation of color in different birds, but each bird yearly regains its own peculiar color. The female, the reeve, is about one-fourth smaller. The males fight for the possession of the females, and in battle the ruff serves for defense. The nest is made among the coarse grass of a hummock, in a moist, swampy place. The four eggs are grayish green, marked with reddish brown. The birds eat insects, worms, seeds, rice, etc. Ruffs are often captured and fattened for the table.

Ruffini (*rö-fē'nē*), **Giovanni,** one of the foremost Italian novelists, was born at Genoa about 1809. He was a fellow-student of the Italian patriot Mazzini, and helped him to organize his famous association, called "Young Italy." When the invasion of Savoy, planned by Mazzini, failed, his brother was put to death, but he escaped to England. In 1848, Ruffini was for a short time Sardinian ambassador at Paris, but the next year he made his home in England. His novel, *Lorenzo Benoni*, is based on his own life. The most famous of his books is *Doctor Antonio*. He died on the Riviera in 1881.

Rug'by, a town of Warwickshire, England, 30 miles southeast of Birmingham. The gunpowder plot was hatched near here, and the battlefield of Naseby is not far off. The famous Rugby school was founded in 1567 by Lawrence Sheriff, a grocer and staunch supporter of Queen Elizabeth. Under the famous teacher, Dr. Arnold, the school gained a national reputation. This school is now, by all odds, the best school in England. Among the many well known students of Rugby were Landor, Clough, Matthew Arnold, Dean Stanley, Lord Derby, Mr. Goschen, and Thomas Hughes, whose *Tom Brown's School Days* is read by boys the world over. See Stanley's *Life of Arnold.* Population about 13,000.

Rum, a kind of spirit made by fermenting and distilling the skimmings from the sugar pans, when sugar is made from cane juice. Enough water is added to the skimmings to produce one gallon of rum to every ten gallons of the mixture. Molasses is sometimes mixed with the skimmings, and a poorer quality of rum is made from molasses alone. The color of rum is given it after distillation by adding caramel or charred sugar. Rum improves with age, and a quantity of rum, known to be 140 years old, was sold in 1865 for $15 a bottle. The best rum comes from Jamaica.

Rum'ford, Count. See THOMPSON, SIR BENJAMIN.

Ru'minant, the name for any cud-chewing animal. The animals belonging to this class are grass and herb-eating forms, as the cow, camel, deer, giraff, sheep, etc. Those living in a wild state are the favorite prey of large flesh-eating animals. In order to crop their food, they must go into open, exposed places, and as the process of mastication is a long, tedious one, they retire to the shelter of concealed positions to ruminate or chew their

Stomach of sheep. (*a*) Œsophagus; (*c*) rumen or paunch; (*f*) abomasum or reed; (*b*) beginning of duodenum.

food properly. The process of chewing the cud cannot be understood without considering the complex stomach of these animals. It consists of four compartments, the paunch, the reticulum or honeycomb bag, the manyplies, and the true stomach. The food when first swallowed is in the form of a coarse pellet which pushes aside a fold in the wall of the œsophagus and goes into the paunch. There it is softened and passed into the reticulum, where it is moulded into pellets of convenient size, which are passed up the œsophagus into the mouth by a process the opposite of swallowing. Here it is carefully masticated and mixed with saliva and then swallowed again. The pellet is now smooth and fine; instead of pushing aside the fold in the wall of the œsophagus, it is guided by it into the third stomach or manyplies. This acts partly as a strainer through which the food passes into the fourth compartment or true stomach. Glands in the walls of this part secrete gastric juice and digestion is carried forward. The camels differ from other ruminants in having no third stomach.

Runeberg (*rö'ne-berg*), **Johann Ludvig,** the greatest poet who has written in Swedish, and the national poet of Finland, was born at Jacobstad, Finland, Jan. 5, 1804. His father,

a retired sea captain, gave him a good schooling. In 1830, Runeberg became reader in eloquence (Latin literature) in the University of Åbo, and also taught in the Lyceum. His beautiful epic idyll, *The Elk-Hunters*, appeared in 1832, followed soon by two others, *Christmas Eve*, and *Hanna*. In this year, Runeberg became editor of a newspaper, and a few years later reader of Roman literature in the College of Borga. Others of his best works are *King Fjalar*, and *Ensign Stals' Stories*, the opening poem of which, *Our Land, Our Land*, has been chosen as the national song of Finland. His poems embody the deepest feelings of the dual people of Finland, of the Finns no less than of the descendants of the Swedish immigrants. Runeberg died at Borga, May 6, 1877. See E. W. Gosse's *Northern Studies*.

Run'ner, a general name given to leafless branches sent out from the main body of the plant, which take root at the tip and produce new plants. The runners of the strawberry and of the eel-grass are well known.

Ru'pert, Prince, third son of the elector Palatine, Frederick V. and Elizabeth, daughter of James I. of England, was born at Prague, Dec. 18, 1619. He studied at Leyden and served in 1637–38 in the Thirty Years' war till at Lemgo he was captured and held prisoner for three years, at Lintz. In 1642, he went to England in time to take part in the civil war. For the next three years the "Mad Cavalier" was the life and soul of the Royalist cause, winning battles by his resistless charges, only to lose them by a too headlong pursuit. After fighting at Worcester, Edgehill, Bolton, Marston Moor, Naseby, and other battles, he surrendered Bristol in 1645, after a three weeks' siege. This so angered Charles, who the year before had made him Duke of Cumberland, that he sent him his passport to leave the kingdom. A court-martial, however, cleared him of all blame and he became again general of his uncle's forces only to surrender at Oxford to Fairfax the following June. In 1648, he became admiral of the part of the English fleet that remained true to the king, and acquitted himself with all his old daring and with a newborn caution. For three years he kept his ships afloat; most of his vessels were burned or sunk in a battle with Admiral Blake. With what were left Rupert escaped to the West Indies, where, with his brother Maurice, he led a buccaneering life, seizing English and other merchant ships. In 1653, he went back to Europe, and, after the restoration, served under the duke of York against the Dutch. The last ten years he spent in study. He improved the art of mezzotint, discovered an improved gunpowder, invented the composition known as Prince's metal, and perhaps the curious glass bubbles, called Prince Rupert's drops. He died, Nov. 29, 1682. See Lord Ronald Gower's *Rupert of the Rhine*.

Ru'pert's Land. See HUDSON BAY COMPANY.

Ru'rik, a Scandinavian adventurer, who became in 862 A. D. ruler or over-lord of a part of Russia, with his court at Novogorod. He is sometimes styled the founder of the Russian monarchy: the Rurik dynasty gave 67 rulers to Russia, and lasted for 736 years, viz., from 862 to 1598 A. D., becoming extinct in the last-named year in the person of Feodor. The seventh of the line (Vladimir I. or The Great) introduced Christianity into the empire; Ivan the Great (or John III.) unified the kingdom and first assumed the title of Czar (tsar).

Rush, Benjamin, was born near Philadelphia, Dec. 24, 1745. He graduated at Princeton in 1760, studied medicine in America and Europe, and became professor of chemistry in the Philadelphia Medical college. Dr. Rush was a member of the continental congress and a signer of the Declaration of Independence. The next year he became physician-general of the army, but resigned in 1778, because he could not prevent frauds on soldiers in the hospital stores. He was a founder of the Philadelphia dispensary, the first in America, and of the college of physicians, and was given several medical professorships besides the one he already held at Philadelphia. During the yellow-fever epidemic of 1793, he was a devoted worker and successful in his treatment. In 1799, Rush was made treasurer of the United States mint. Among his medical writings, which were honored at home and abroad, were *Medical Inquiries and Observations*, *Essays*, and *Diseases of the Mind*. Dr. Rush died at Philadelphia, April 19, 1813.

Rusk, Jeremiah M., was born June 17, 1830, in Morgan county, O. In 1862, he enlisted in the 25th Wisconsin volunteers, was made major the same year and lieutenant-colonel in 1863. He served in congress several terms, and was elected governor of Wisconsin in 1881 and twice re-elected. In 1889, the new department of agriculture having been created, he was made its first secretary, and died in Wisconsin, Nov. 21, 1893.

Rus'kin, John, the great art writer, was born at London, Feb. 8, 1819. He was the only child of a wealthy wine merchant. He took his degree at Oxford in 1842, and studied painting under Copley. The story of the earlier years of his life has been told by Ruskin himself in his *Præterita*, one of the most charming autobiographies in the language. In 1843, came out the first volume of *Modern Painters*, which treated of the principles of art in an independent and even revolutionary way, and though greatly opposed at first, Ruskin's views have largely determined the character of later English art.

In 1849, appeared *The Seven Lamps of Architecture*, and two years later *The Stones of Venice*. The titles of Ruskin's books often give no indication of the subject. *Notes on the Construction of Sheepfolds* deals with church discipline; *The Crown of Wild Olive* is four essays on work, traffic, war, and the future of England; *Sesame and Lilies*, lectures on good literature; *The Queen of the Air*, on the Greek myths of cloud and storm; *Ethics of the Dust*, lectures on crystallization. From 1869 to 1879, Ruskin was professor of art at Oxford. Ruskin is noted for his splendid style, which for eloquence, power, and richness has hardly its equal. In art he tells us that he aimed to set forth the "supremacy of five great painters, despised till he spoke of them — Turner, Tintoret, Luini, Botticelli, and Carpaccio." His *Munera Pulveris* deals with political economy, on which he has written from an independent point of view. See Cook's *Studies on Ruskin*. He died at Brantwood, in the English lake region, Jan. 20, 1900.

JOHN RUSKIN.

Rus'sell, John, Earl, English statesman, was born Aug. 18, 1792, at London, the third son of the duke of Bedford. He studied at Edinburgh, and entered parliament in 1813, where he made his first motion in favor of parliamentary reform in 1819. In 1830, the Liberals came into power and though Russell was not a member of the cabinet, he was one of four who framed the first reform bill. In 1835, he became home secretary and leader of the house of commons, and introduced most of the important bills passed at this time. In 1839, he became colonial secretary. In 1845, a letter in favor of repealing the corn laws written to his London constituents, caused the downfall of the Tory ministry, and Lord John was asked to form a new ministry, but failed, owing to jealousies between the Liberal leaders. But the next year Russell became prime minister. Famine and rebellion in Ireland, and troubles in England beset the ministry, which fell in 1852. He soon, however, became foreign secretary, but his mismanagement of the Crimean war made him unpopular, and he was out of office for four years. In 1859, he again became foreign secretary, which office he held for six years. Among the features of his management of affairs were England's unfriendly tone toward the United States in the *Trent* affair, her taking part in the Mexican expedition, the interference with Russia in favor of Poland, and the friendly feeling of England for Denmark during the Schleswig-Holstein war. In 1865, Lord John, now Earl Russell, became prime minister for the second time, but kept in power for only a year. He died May 28, 1878. See Spencer Walpole's *Life of Lord John Russell*.

Rus'sell of Killowen, Baron **Charles,** distinguished British jurist and statesman, was born at Newry, Ireland, Nov. 10, 1833, and died at London, Aug. 10, 1900. Educated at Trinity college, Dublin, he began his career as a parliamentary leader writer, and was called to the bar at Lincoln's Inn in 1859. of which he later on became a bencher. From 1880 to 1885, he represented Dundalk, and from 1885 to 1894 south Hackney in the British house of commons, and was twice attorney-general in Mr. Gladstone's administration. Though a Liberal, and an ardent Home Ruler, his political aspirations were subordinate to love of his profession, of which he became a great ornament. He was knighted in 1886. As a sound lawyer, acute cross-examiner, and persuasive advocate, Sir Charles Russell was for long without a rival at the English bar. In 1889, he increased his reputation by his masterly oration at the Parnell commission, where he was counsel for the great Irish leader. He was one of the English counsel in the Bering sea arbitration, and also served on the Venezuelan boundary arbitration tribunal. In 1896, he visited the United States and delivered an address on "International Arbitration" before the American Bar association. In 1894, he was appointed a lord of appeal in ordinary, with a life peerage, and succeeded Lord Coleridge as lord chief-justice of England.

Rus'sell, William, Lord, an English patriot, was born Sept. 29, 1639. He studied at Cambridge and then traveled for a time on the continent. In 1669, he married an heiress, Lady Rachel Wriothesley. In 1674, he spoke in the house of commons, of which he had been a silent member since the restoration, against the doings of the "Cabal," the famous advisers of Charles II. From this time he was a leader of the commons. He believed in the popish plot and carried up to the house of lords the bill to shut out the duke of York from the throne. Russell, Essex, and Sidney were arrested on suspicion of having taken part in the Rye House plot. By means of infamous witnesses and a packed jury he was found guilty. His father's offer of $500,000 for his life was refused; he would not accept a plan made for his escape; and on July 21, 1683, he was beheaded. Pity for his judicial murder, and the letters of his noble wife, who at his trial appeared at court as his secretary, have served to keep his memory fresh as a Christian hero. See the *Letters* of Lady Russell; and his *Life*, by Lord John Russell.

Rus'sell, William Clark, English novelist, was born at New York, Feb. 24, 1844. He is

the son of Henry Russell, who composed *Cheer, Boys, Cheer; There's a Good Time Coming; A Life on the Ocean Wave*, etc. Young Russell went to sea at thirteen, and served eight years. Since that time he has been an English newspaper writer and novelist. His sea tales rank with those of Marryat and Cooper, and are deservedly popular. Among them are *Jack's Courtship, My Shipmate Louise*, and *The Wreck of the Grosvenor*.

Russia (*rush'yă*), **Empire of**, covers a large part of eastern Europe, and northern and central Asia, a territory more than twice as large as Europe. Its main divisions are European Russia, with less than a fourth of the whole area, but with three-fourths of the population; Finland, Poland, Siberia, Caucasia, Turkestan, and the Transcaspian region, besides the dependent countries, Khiva and Bokhara. Not counting the dependent states, the area of Russia is 8,660,395 square miles, and the population 130,000,000. The Arctic ocean made up the whole Russian seaboard, till, at the end of the 17th century, she won the Baltic and Black sea shores. On the north, the Arctic ocean, White sea, Kara sea, Bering sea, and sea of Okhotsk, are valuable for fishing and hunting, but these coasts are frozen a great part of the year, and Nova Zembla and their other islands are uninhabited. Vladivostok, at the head of the gulf of Peter the Great on the Japanese sea, is one of the finest roadsteads in the world. The chief Russian sea is the Baltic with the gulfs of Finland, Bothnia, and Riga, on which are four out of the five chief ports of the country —St. Petersburg, Reval, Libau, and Riga. The sea of Azov is the great gulf of the Black sea, and its main ports are Odessa, Batoum, and Taganrog. The Caspain sea furnishes fish for all Russia; into it falls the largest river of Europe, the Volga.

Caucasus, Finland, Poland, Siberia, and Turkestan are described under these heads. A plain 700 miles wide crosses European Russia from southwest to northwest. The Urals, a series of ranges running southwest to northeast, are highest at Mt. Iremel—4,680 feet. The Niemen, Dwina, Neva, Onega, and North Dwina rivers have their sources in the broad central plain and flow in general northwest, while the Dnieper, Don, and Volga rise in the same plain but flow southeast. The other three large rivers are the Vistula, Dniester, and Pruth. The headwaters of some of these rivers have been connected by canals, as the Volga and Neva, so that now St. Petersburg stands not only at the mouth of the Neva, but also at the real mouth of the great Volga basin. The tundras of the Arctic shore are in the main covered with mosses and lichens. South of the tundras are forests of evergreens, and south of these, forests of oak, birch, and hornbeam. Still further south are the Russian steppes or prairies.

Of the population of Russia, it is estimated that 66 per cent. are Russian Slavs; seven per cent. Poles; five per cent. Finns; nine per cent. Turco-Tartans; three per cent. Jews. A recent partial census shows that the number of Jews in Russia exceeds 4,000,000. In 1900, the total population of all Russia was 135,000,000. The chief cities are St. Petersburg, the capital (population, with suburbs, 1,267,023), Moscow (population 988,614), Warsaw (population 638,209), and Odessa (population 405,041). The entire area of the empire is 8,660,395 square miles. This includes, besides European Russia, Poland, Finland, the Caucasus, Transcaucasia, Turkistan, Eastern and Western Siberia, the Transcaspian, the Steppes, and the Amur region.

The Russian empire is an absolute monarchy. The whole legislature, executive and judicial power, is united in the emperor, whose will alone is law. There are, however, certain rules of government which the present lines of sovereigns have recognized as binding. These provide that the law of succession to the throne shall be that of regular descent, by right of primogeniture, with preference of male over female heirs, and that every sovereign, with his consort and children, must be members of the orthodox Greek church. The administration of the empire is intrusted to four boards or councils. These are: first, the *Council of the State*, which consists of a president and an unlimited number of members appointed by the emperor, and which has advisory power in matters of legislation, but no power to change laws of the realm; second, the *Ruling Senate*, which promulgates the laws and also is the high court of justice for the empire; third, the *Holy Synod*, to which is committed the superintendence of the religious affairs of the empire; and fourth, the *Committee of Ministers*, which consists of all the ministers or heads of departments, and other functionaries, and of which the privy councilor is president.

Russia is divided into governments, each ruled by a governor; Finland alone has a representative government, which is fast disappearing. But in most parts of Russia there is at the same time considerable local self-government. Peasants make up four-fifths of the whole population. The other classes are burghers, merchants, the clergy, and the military. Among the peasants of Great Russia, the mir, made up of all the village householders, distributes in allotments the land, which is held in common, buys farm machinery, hires doctors, teachers, etc. Taxes are mainly in the hands of the zemstvos, or district assemblies, elected by nobles, clergy, town householders, peasants, and landowners, but their rights were greatly curtailed in 1890.

Though Russia has trial by jury, it does not apply to political cases, and every year from 15,000 to 20,000 prisoners are exiled to Siberia, many without any trial at all.

Russia's army has a peace footing of 1,169,000 and a war footing of 4,600,000. She has in her navy, including ships building, 24 battleships, 8 coast defense vessels, 22 cruisers, 49 gunboats, 34 destroyers, 193 torpedo boats, besides training ships, transports, etc. The land is held by the crown, by peasants' communes, and by landowners, mainly nobles and merchants. Most of the schools in the empire are under the ministry of public instruction, though many special schools are under separate ministers. The total contribution for education in 1899 was 51,062,842 roubles; of this 4,108,045 roubles were for universities. There are universities at Moscow (4,407 students), St. Petersburg (3,788), Kiev (2,604), Karhov (1,387), Yurger (1,208), Warsaw (1,114), Kasau (879), Odessa (709), Tomsk (401). There are many other institutions of higher grade. The number of middle schools in 1899 (exclusive of Finland) was 1089, with 212,440 pupils. The number of elementary schools in the empire in 1896 was 78,724, with 113,984 teachers and 3,779,818 pupils.

Gold is found in the Urals and Siberia; silver and lead in Siberia, the Kirghiz Steppes, the Caucasus, and Finland; platinum in the Urals; zinc in Poland; tin in Finland; cobalt and manganese in Caucasia; while iron is abundant in most parts of the empire. Salt is got from the southern lakes; coal from Poland and about the Don river and other parts of Russia; and petroleum in Baku. Russia did not become a manufacturing nation to any great extent until the serfs were freed. Her manufactures now amount to $1,460,000,000 yearly. In 1893, there were within the empire 22,483 manufacturing establishments, employing 1,400,000 men and women, and having a yearly monetary production of 1,759,331,000 roubles (the value of the gold rouble is about 75 cents). Wheat and flour head the list of exports, and cotton, tea, and raw metals that of imports. Inland trade is much helped by the great yearly fairs at Nijni-Novgorod, Kharkoff, and other cities. Trade is carried on in great part by means of the great network of rivers, besides which there are over 35,000 miles of railroad. The government owns more than one-half of the railroads. In November, 1901, the last rail on the trans-Siberian railway was laid, completing the line from St. Petersburg to the Pacific coast, except as intercepted by Lake Baikal, across which, a stretch of sixty miles, trains are transported on an ice-breaking ferry boat. The road with its branches is nearly six thousand miles in length, and was built in ten years at a total cost of about four hundred million dollars. There are fifty-five thousand miles of navigable rivers in the empire, besides five hundred and seven miles of canals and seven hundred and eleven miles of canalized rivers.

The Russians are Slavs and conquered Russia from the west, fighting eastward from the Baltic sea. However, the name Russes was first given to Norman warriors who yearly passed through these Slav lands on their way to enter the Byzantine emperor's service at Constantinople. These captains seem to have been asked to protect the Slavs, and one of them, Burik, with three of his brothers, settled there. Vladimir (980–1015) was baptized a Christian, and soon after his death Kieff, the "mother of the Russian towns," rivaled Constantinople in greatness. Under Yaroslav, who gained control of most of the Russian towns, and died in 1054, the first written Russian law was compiled. During the next 200 years the Russians steadily conquered eastward. Towns and colonies were founded, which were in reality free republics, the only bonds between the different cities being those of language, race, religion, and the unwritten law that the prince who was asked to defend a town should be a descendant of Yaroslav. In this period the trading cities, Novgorod, Pskov, and Smolensk, rose to importance. Slavery existed, though the workers of the soil were its owners, the slaves being either prisoners of war or those who remained in a servant's position for more than a year. In these years also the boyars, the chief warriors, began to gain power, settling the peasants on free lands, and making themselves their landlords. Andrei Bogalubskiy (1157–74) was the prince who changed the center of gravity of Russia from Kieff to the region where Moscow was afterward founded. He built the city of Vladimir, and plundered and burnt Kieff in 1169. Soon Nijni-Novgorod was founded as a rival of Novgorod, and this region, the home of the Great Russians, grew powerful.

In 1224, the Mongols and Tartars who, under Genghis Khan, had conquered Manchuria, North China, Turkestan, and Bokhara, won a decisive battle against the Russians on the Kalka river. From this time Russian princes paid tribute to the khan; their courts, which had now an eastern appearance, were surrounded by Tartars and Mongols; and it was with Mongol help and armies that the rich rulers of Moscow reduced to their rule the formerly independent principalities around them. The Mongol conquest threw Russia 200 years behind the civilization of the rest of Europe, and gave Poland, Lithuania, and Livonia a chance to rise into power.

It was in the 14th century under the leadership of Moscow that the Russians first tried to throw off the Mongol yoke. Dimitri Donskoi (1359–89) fought an indecisive battle at Kulikovo, followed the next year by the Mongols for the last time storming Moscow, burning it, and killing 24,000 of its people. Ivan III. (1462–1505) was the first prince of Moscow to call himself "Ruler of all Russia." He conquered Novgorod, and refused to pay further tribute to the khan. A Tartar-Mongol army of 150,000 men sent to punish him, met the Russians on the Oka, and after

a nine months' encampment retreated without fighting, and Russia was again free.

Ivan IV., "the cruel," was the first to take the title of tsar, and was Russia's first absolute ruler. When at three years of age he came to the throne, the boyars were all powerful, and to maintain any power as prince, a struggle was forced upon him, in which he was successful, but at the cost of thousands of lives, no less than 3,470 victims being inscribed by Ivan himself in his prayer book. Under Ivan's feeble son Feodor (1584–98) the regent Boris Godunoff forbade the peasants to leave the estates on which they worked, and thus sowed the seed which grew into the serfdom that cursed the country for the next 270 years. This regent murdered Ivan's son Dimitri. On Godunoff's death, a runaway monk, who lived for some time among the Cossacks ("free men"), who were runaway peasants banded together on the Don and Dnieper, imposed himself on Russia as the murdered Dimitri. His assassination at the end of a short reign, was followed by the conquest of the czardom by Sigismund of Poland. The country was freed by a general rising, started by Minin, a Nijni-Novgorod merchant, and aided by the Cossacks. The Poles were driven out, and Mikhael Romanoff (1612–45), whose grandmother was Ivan's first wife, was chosen ruler.

In the reign of Alexis (1645–76) Russia, chiefly by the aid of the Cossacks, at last gained the upper hand in the long struggle with the rival Slav power, Poland. Up to the reign of Peter the Great (1689–1725) the country had been in many respects Mongolian; this able ruler, who first called himself emperor and founded the new capital, St. Petersburg, made it European. He improved the army, started mining and manufactures, imported fine breeds of cattle, set up schools, and dug Russia's great system of canals. The ministers, Menschikoff, under Catharine I., and Dolgorouki, under Peter II., were the real rulers of those reigns. The power of the German party under Anne (1730–40) and Ivan (1740–41) was lost on the accession of Elizabeth (1741–62). Peter III., who by sending his army to the support of Frederick the Great against Austria saved Prussia from dismemberment, was dethroned by Catharine II. (1762–96), whose wars and the first partition of Poland widened Russia's domains in all directions. The excessive tyranny of Paul I. (1796–1801) brought about his murder. In the reign of Alexander I. (1801–25), the famous friend and enemy of Napoleon, took place the French invasion and the burning of Moscow. Under Nicholas I. (1825–55), was fought the Crimean war. Alexander II. (1855–81) freed the serfs, and initiated many other reforms, which were brought to a sudden close by the insurrection of Poland (1863) and the rise of the Nihilists, who three years after the close of the war with Turkey (1878) assassinated him, March 13, 1881. The reign of Alexander III. (1881–94) was marked by the famine of 1890–91, and the crusade against the Jews, who were ordered to leave Moscow, Warsaw, and other cities, and to go back to their native provinces, already overcrowded, and laid waste by famine. Of recent years, a more enterprising era seems now to have opened for Russia, though the national debt is a heavy burden on the empire's resources, added to the nation's large and increasing annual expenditure. The present emperor, Nicholas II., ascended the throne on the death of his father, Oct. 20, 1894. See Rambaud's *History of Russia*, and Edwards' *The Romanoffs*.

Rust. Neither wrought iron nor steel nor cast iron can be exposed to moist air without rusting. But wrought iron, being nearly pure iron, rusts more readily than either of the others, which contain carbon. When a drop of rain falls on a clean, bright-surface of iron, for a short time the drop stays clear, showing the bright surface of the iron through it. But soon a greenish appearance, which is a precipitate, is seen in the drop, and quickly becomes a reddish-brown — the peroxide of iron, or rust. The rust does not stick to the iron but is hung in the water, and becomes a coating only when the water has evaporated. Iron remains quite free from rust in an atmosphere containing water vapor so long as the water vapor does not condense as liquid water on the surface of the iron. But when rust once forms, the iron will go on rusting in an atmosphere in which a piece of clean iron will not rust, because liquid water will condense on rust when it will not on bright iron. So it is much easier to prevent the first formation of rust than to stop the process. To prevent rust oil paint is used, also a zinc coating or "galvanizing" and japanning.

Rust (in plants), a destructive disease caused by the attacks of certain parasitic fungi, as wheat rust. See ÆCIDIOMYCETES.

Ruth, a young Moabitess, who, after the death of her Hebrew husband, Mahlon, for the sake of her mother-in-law Naomi, came to settle in Bethlehem. There she became the wife of a near kinsman, Boaz, and the mother of Obed, grandfather of King David. The story is told in the book of Ruth, and is placed "in the days when the judges judged," about a century before the time of David.

Rut'land, Vt., is on Otter creek, close to the Green mountains and 67 miles southeast of Burlington. The main business is quarrying and working marble. There are also foundries and railroad shops and it has the state poorhouse. Its marble quarries are the best in the state, and yield fine white blocks equal to the statuary marble of Carrara. The town was settled in 1770, and was one of the state capitals from 1784 to 1804. Population 11,499.

Ruwenzori (*rō-wĕn-zō'rē*), a mountain in the center of Africa, just north of the equator, between lakes Albert Nyanza and Albert Edward Nyanza. It was discovered by Stanley in 1888, and is thought to be 19,000 feet high. Its top is always covered with snow. Stanley thinks this peak and some neighboring ones — Mount Gordon Bennett and Mackinnon Peak — are the mysterious Mountains of the Moon, which geographers of the middle ages put on their maps of Africa, but which modern research has been unable to discover.

Ruysdael (*rois'dal*), **Jakob,** the greatest Dutch landscape painter, was born at Haarlem about 1625. He loved to paint forest glades with oak trees, sleeping pools beneath groups of trees, with an old picturesque building, a mill or a ruined temple, or a glimpse of a distant town; a waterfall with rugged rocks, and coast scenes where earth and water meet. He died in the Haarlem almshouse March 14, 1682.

Ruyter (*ri'ter*), **Michael Adrianszoon de,** Dutch admiral, was born at Flushing, Holland, March 24, 1607, of poor parents who sent him to sea as a cabin boy when only eleven. He became captain in the navy in 1635, but between 1643 and 1652, he was in the merchant service and fought against the Barbary pirates. When war broke out between Holland and England, in 1652, a fleet was given to Ruyter. With it he beat off an attack made on him by the English, and attacked the English Admiral Blake off the mouth of the Thames, but was forced to retire. Two months later he totally defeated Blake off Dover. He took part in the naval battles of the next year, and when Tromp was killed in the battle off the Texel, was made vice-admiral. After the close of the war, in 1654, Ruyter was sent to blockade the coasts of Portugal, and then those of Sweden, where he forced the surrender of Nyborg in 1659. For this service he was ennobled by the king of Denmark. The years 1661–63 were taken up in checking the piracy of the north African states in the Mediterranean. War again broke out between Holland and England in 1664, and De Ruyter steered his fleet to the west coast of Africa, and took from the English Goree and some forts on the Guinea coast. The next year he destroyed many English merchantmen in the West Indies, ravaged the Scottish coast, and returned home to be made admiral-in-chief. The year after he fought four days against Monk and Prince Rupert, finally driving off the British fleet, but a month later was driven back to Holland by Monk. In 1667, De Ruyter threw London into a turmoil by sailing up the Medway as far as Rochester, burning English ships, and entering the Thames a second time as high as Gravesend, besides attacking Harwich. In 1672, war began against both France and England. In this war the Dutch admiral fought the French and English in Solebay, defeated Prince Rupert and D'Estrées off Schooneveldt, and again off Kijkduin and Helder. After this defeat England made peace. In 1675, DeRuyter sailed to the Mediterranean to help the Spanish. The Dutch-Spanish fleet fought the French in the bay of Catania, on the east of Sicily. Here DeRuyter was wounded, for the first time in his life of battles, and died a week later, April 29, 1676. DeRuyter was a man of piety, simple in his manners, and of unflinching courage. As a seaman he ranks with such captains as Nelson and Blake.

Rye, the well-known species of *Secale cereale*, a grass which is probably from western Asia. It closely resembles and is related to the wheat.

Rye-House Plot. In 1682–83, while a scheme was formed among the leading Whigs of England to raise the nation in arms against Charles II., another scheme was planned by a few fiercer spirits of the party to waylay and kill the king. It was to be carried out at a farm near Hertford, belonging to one of the plotters, called Rye-House. The plot failed because the house at Newmarket, where the king was staying, caught fire accidentally and caused Charles to leave eight days sooner than he had intended. Both the greater and lesser conspiracy were discovered before long, and though Monmouth, Russell, and other Whig leaders had nothing to do with the Rye-House plot, the indignation aroused by it throughout the country took in the whole party. Lord Russell, Algernon Sidney, and Walcot — the last one of the real plotters — were brought to the block. Hardly any one connected with either plot escaped.

Ryswick (*riz'wik*), **Peace of,** was signed at Ryswick, a Dutch village two miles south of The Hague, by France, England, the Netherlands, and Spain, on September 21, and by Germany on Oct. 30, 1697. It wound up the bloody contest between France and the allies, which had been carried on since 1688.

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Sabine (*sa-bēn'*), a river of Texas, rises near the northern state boundary, and flows southeast to the border of Louisiana, and then south, forming the boundary between the two states. It empties through Sabine lake—18 miles long and 9 miles wide—in the gulf of Mexico. The Sabine is 500 miles long, is shallow, and navigable only in parts for small steamboats.

Sa'bines, an old Italian people who lived first among the central Apennines, but afterward reached down into the western plains, even to Rome itself. According to the story, a colony of Sabines occupied the Quirinal hill in Rome, but were at last joined to the Latin followers of Romulus on the Palatine hill, and so helped to make up the Roman people. It is said that Romulus, finding it hard to get wives for his followers, who were rather looked down upon as runaways and criminals, invited the Sabines to a feast and games. While the games were going on, the garrison of the Palatine seized the unsuspecting women, whom they carried off to be their wives. After several wars, the Sabines, outside of Rome, were conquered in 241 B. C.

Sa'ble. See MARTEN.

Sa'ble Island, a low-lying island in the Atlantic, 100 miles south of Cape Breton, to which it belongs. It is made up of two sand ridges, with a lagoon between them. The island has been called "the sailors' grave," from the many shipwrecks happening there. Since 1873, three lighthouses have been built, of which two have been swept away and one undermined, as the island is fast sinking. Early in the past century it was 40 miles long, but now it is not more than 20 miles in length. Near it, there are sandbanks and valuable fisheries.

Sack'ett's Har'bor, a village of New York on a bay of Lake Ontario at the mouth of Black river, 12 miles west of Watertown. The harbor is one of the best on the lake. In the War of 1812, Sackett's harbor was the headquarters of the northern division of the American fleet, and several war vessels were built here. It was twice attacked by the British, who were driven off, the last time with a loss of 150 men. Sackett's Harbor is now becoming a popular summer resort. Population 1,266.

Sack'ville, Lord, **Lionel Sackville-West,** English diplomatist, was born in Cambridgeshire, England, the fourth son of the fifth Earl De La Warr, July 19, 1827. He entered the British diplomatic service in 1847, served as an attaché to the English legations at Lisbon, Naples, Stuttgart, and Berlin until 1858, when he acted as secretary of legation at Turin, Madrid, and Berlin, and as secretary of embassy at Paris. He was then appointed envoy extraordinary to the Argentine Republic, was afterward transferred to Madrid, and in 1881 became minister plenipotentiary to the United States. While at Washington, he acted in 1887 at the conference on the affairs of Samoa, and in conjunction with Mr. (now Sir) Joseph Chamberlain and the elder Sir Charles Tupper, of the Canadian Dominion government, he negotiated the Fisheries treaty of Washington (1888). In the latter year, for having indiscreetly advised a naturalized British subject in this country to vote the Democratic ticket as being favorable to British interests, he received from the United States government his passports and returned to England. The incident occurred during the presidential canvass, when Mr. Cleveland was renominated by the Democrats, and Mr. Benjamin Harrison was the Republican candidate.

Sacramento (*sāk-ra-mĕn'tō*), capital of California, is on the east bank of the Sacramento river, at the mouth of the American river, 90 miles by rail northeast of San Francisco. The main public buildings are the capitol, which cost about $2,000,000; the courthouse, hospital, post office, a Roman Catholic cathedral, the Crocker art gallery, and the Masonic and Odd Fellows' halls. There are flour and planing mills, carriage, box, and broom factories, foundries, potteries, spice mills, and a cannery. Here also are the shops of the Southern Pacific railroad, covering twenty-five acres. Sacramento was settled in 1839 by a Swiss, who built a fort there in 1841. It was not till 1848, after the discovery of gold, that the city, at first a town of tents, was laid out. It became a state capital in 1854. Population 29,282.

Sacramen'to, the largest river of California, rises in the northeastern part of the state, and flows southwest through the Sierra Nevada to Shasta, south to Sacramento, and thence southwest into Suisun bay, through which its waters pass into San Pablo bay, and so to the Pacific ocean. It is about 500 miles long, and is navigable for small boats to Red Bluff, nearly 250 miles. Its chief branch is the San Joaquin.

Sacs and Foxes, Indian tribes which settled near Green bay, Wis. They lived and usually acted together. They both belong to the Algonquin family. Among the Sacs, the children of each family at birth are marked white or black in turn, thus dividing the tribe into two bands, the white or Kiscoquah and the black or Oshkosh. The Foxes were also in two branches, the Outagamies (foxes) and the Musquakink (men of red clay). Both tribes were daring and warlike, fighting coura-

geously the much more numerous Iroquois and Sioux. The French had no greater enemies, and the English no greater friends than the Foxes, who attacked Detroit in 1812, and were cut to pieces at Presque Isle on Lake St. Clair, to which they had retreated. The Sacs on the whole favored the English, serving under Pontiac, supporting the British in the Revolutionary war, and fighting under their renowned chief, Blackhawk, in 1832, to recover their hunting grounds from the United States. In 1857, a party of 317 Sacs and Foxes bought lands at Tama, Ia., which they have worked, becoming industrious and self-supporting. The two tribes now number about 1,000, separate bands living in Iowa, Nebraska, Kansas, and the Indian Territory.

Sadi (*sä'dē*), the assumed name of Sheikh Muslih Ad-din, one of the most celebrated of Persian poets, who was born at Shiraz about 1184. Little is known of his life. His father's name was Abdallah, and he was a descendant of Ali, Mohammed's son-in-law. He studied science and theology at Bagdad, and from here made the first of fourteen pilgrimages to Mecca. He traveled for many years in parts of Asia, Africa, and Europe. Near Jerusalem he was captured by the crusaders, but was ransomed by an Aleppo merchant, who recognized him, and gave him his daughter in marriage. He is said to have been a short, slim, and spare man, pious and quiet in his ways. Called the "nightingale of a thousand songs," he fully deserved the honors showered on him by princes and nobles, during his life and after his death. The catalogue of his works contains twenty-two different kinds of writing in prose and poetry, in Arabic and Persian. The greater part are odes and dirges. The finest of his works is *Gulistan*, or Flower-garden — a kind of moral work in prose and verse, made up of eight chapters on such subjects as kings, old age, and education, together with stories, puns, and maxims. Two others of his works are *Bustan* or Tree-garden, *Pand-Namah* or Book of Instructions. See Robinson's *Persian Poetry for English Readers*, and Sir Edwin Arnold's *With Sádi in the Garden*.

Sadowa (*sä-dō'vä*), a Bohemian village 58 miles northeast of Prague, where an important victory was gained by 240,000 Prussians under King William I. over 220,000 Austrians under General Benedik, July 3, 1866. The battle lasted from 8 A. M. to 4 P. M., and resulted in the rout of the Austrians, who lost 21,000 men, with 22,000 prisoners. The Prussian loss was 9,000 men. This battle, which is often called Königgratz, from a town eight miles distant, decided the German-Italian war of 1866.

Safe'ty Lamp. When marsh gas, which is often set free in large quantities from coal seams, is mixed with ten times its volume of air, it becomes highly explosive. Moreover this gas, the fire-damp of mines, in exploding, renders ten times its bulk of air unfit for breathing, and the choke damp thus produced is often as fatal to miners as the first explosion. To do away with these dangers, Sir Humphry Davy began his experiments on flame, which resulted in his invention of the safety lamp. He found that when two vessels filled with a gaseous explosive mixture are joined by a narrow tube, and the contents of one fired, the flame does not reach the other, provided the thickness of the tube, its length, and the conducting power for heat of its material, bear certain proportions to each other; the flame being put out by cooling, and its transmission made impossible. He found also that high conducting power and less thickness make up for less length; and to such an extent may this shortening of length be carried that metallic gauze, which may be looked upon as a series of very short square tubes arranged side by side, wholly stops the passage of flame in explosive mixtures. His lamp consists of a burner inclosed in a wire gauze. When such a lighted lamp is brought into an explosive mixture of air and fire-damp, the flame is seen slowly to enlarge as the amount of fire-damp increases, until it fills the entire gauze cylinder. Whenever this pale, enlarged flame is seen, the miners should at once get to a place of safety; for although no explosion can take place while the gauze is sound, yet at that high temperature the metal becomes rapidly burnt and might easily break, and a single opening, if large enough, would then cause a destructive explosion. Many improvements have since been made in Davy's lamp.

Saf'fron is got from the dried flowers of the saffron crocus. It is used as a coloring matter for some articles of food and medicines. It was formerly used for dyeing cloth yellow. Saffron was of much greater importance centuries ago than it is now. The early Greeks used it as a dye, and both they and the Romans, as a perfume. As late as the 15th century, persons were burned alive in Nuremburg for adulterating saffron. The plant is raised in Persia, Afghanistan, Cashmere, southern Europe, and England.

Sage, a general name for a species of *Salvia*, a genus of the mint family, containing about 500 species, and distributed throughout the temperate and tropical regions. Over 30 species are found in North America. The common garden sage is *S. officinalis* from southern Europe. The showy red flowered species which are common in gardens and parks are derived from several species, prominent among which are *S. splendens* of Brazil and *S. fulgens* of Mexico.

Sage-Cock or **Sage-Grouse,** the largest grouse found in North America. It lives on the western plains in the Rocky mountain region and feeds on wild sage, from which cir-

cumstance its name is derived. The upper parts are brown, varied with gray, black, and buff, and the under parts mostly black. A full-grown male reaches a weight of six pounds. The bird has a long pointed tail composed of twenty stiff feathers. It has also large air-sacs of yellow skin on each side of the neck. These are inflated in the spring and enable it to produce a deep, hollow tone.

Sage, Russell, American capitalist and financier, was born in Oneida county, N. Y., Aug. 4, 1816; was brought up on a farm and received his education at the public schools. In early life, he engaged in mercantile pursuits at Troy, N. Y., and was elected to congress as a Whig in 1853, serving for four years. In 1863, he removed to New York city, where he became interested in railways, especially in the New York elevated railroad system, as well as in various telegraph and cable companies. Later on he secured interest in western railroads, chiefly in the Milwaukee and St. Paul, and was associated with the Goulds in their control of other western lines. Becoming a large operator in railway and other stocks, and from buying and selling "privileges" in Wall street, he amassed large wealth, and became director in numberless New York corporations.

Saginaw (*sag'i-naw*), the third city of Michigan, stands on both sides of the Saginaw river, 108 miles northwest of Detroit. The city is the headquarters of the Saginaw bay lumber and salt trade, and its flour mills, furniture, and other factories reach for three miles along the river. It is a busy, growing place, and was until recently separated into the cities of Saginaw and East Saginaw. Saginaw was founded in 1822. Population 42,345.

Sag'inaw Bay, an arm of Lake Huron, and the largest inlet of the southern peninsula of Michigan, is 60 miles long and 30 miles wide. The river Saginaw, 30 miles long, falls into it. It has several good harbors, and under its islands and shores vessels find shelter from the fierce storms which sweep over the expanse of Lake Huron.

Sa'go, a starch obtained from the stems of certain palms. See PALM.

Saguenay (*sâg'e-nâ'*), a large river of Canada, falling into an inlet of the St. Lawrence, about 115 miles below Quebec. It drains Lake St. John, and is about 100 miles long. In its lower course it flows between cliffs, often from 500 to 1,500 feet high, and is in many places two or three miles broad. Its scenery is beautiful, and it is navigable for the largest steamers to Ha Ha bay.

Sagun'tum, a wealthy and warlike town of early Spain, stood where is now the modern town of Murviedro, near the mouth of the Pallantias river. It was a Greek trading town of prominence, but is kept in memory because of its siege and destruction by the Carthaginians under Hannibal in 219 B. C. Having held out the greater part of a year against the great captain and his army of 150,000, the half-starved Saguntines preferred death to unavoidable surrender. Heaping their valuables into one huge pile, and placing their women and children around it, the men made a last sally, and the women fired the pile, casting themselves upon it with their children, thus expiring in the flames at the same time that their husbands were dying in battle.

Sahara (*sa-hâ'ra*), the vast desert region of North Africa, stretching from the Atlantic to the Nile, and from Morocco, Algeria, Tunis, and Tripoli, south to the Sudan, is estimated to have a total area of 2,386,000 square miles. It is a link in the chain of great deserts which girdle the Old World from the Atlantic across Africa, Arabia, Persia, Turkestan, and Mongolia, to the Pacific. The old idea that the Sahara was a vast expanse of sand, and that it was once the bed of an inland sea, is hardly true. The surface is mostly above sea level, and in one place reaches a height of 8,000 feet. However, of large tracts next to nothing is known. On the northern side of this desert is a vast bow of sand hills; the middle portion is a high tableland with snow-clad mountain peaks; and in the east and west are mountain ranges. Water can almost always be found in the hollows between the sand dunes, and also a little below the surface in the deep valleys between the western mountains, these valleys being mostly dry beds of old rivers. In many parts of the Sahara are oases, islands of green in the midst of an ocean of desert. These oases are found most plentiful on the southern side of the Atlas and Algerian mountains, on the northern side of the large central tableland, and along certain lines across the desert, which mark the caravan routes between the Sudan states and the Mediterranean.

A large part of the Sahara, though not the whole, was once undoubtedly under water. The greater part of the surface seems to have been raised, and a process of drying up, similar to that which is now going on in the Turkestan desert, has gone on here from the earliest historic times. The sand is the Saharan rocks ground to dust. The great heat by day causes the rocks to expand; the great fall of the temperature by night, together with the great evaporation which then takes place, makes them split and crack, and break in pieces; and the strong, fierce winds use these pieces like files or sand blasts to grind to fragments other rocks. These desert sand storms are more feared by the traveler than lack of water. Thick deposits of sand have been found on the floor of the Atlantic, a long way west of the African coast. The thermometer falls from above 100° F. during the day, to just below freezing point at night.

On the oasis grow date palms, oranges, peaches, and other fruits, rice, millet, etc. In

the desert little grows except thorny shrubs and coarse grasses. The giraffe, antelope, wild cattle, the wild ass, jackal, ostrich, crow, viper, python, locusts, and flies are found. The camel is the great carrier across the Sahara. The people of the Sahara, numbering from 1,400,000 to 2,500,000, are Moors, and other Berbers, Negroes, Arabs, and Jews. The chief products are dates and salt. But a large trade is carried on by caravans, bringing to the Mediterranean ivory, ostrich feathers, gums, hides, gold dust, etc. To get this trade the French are building a railroad from Algiers, which is to extend across the Sahara to the Niger. Another road is projected from Tripoli to the Sudan. Different plans for flooding the Sahara and so making it an inland sea, have been proposed but have been dropped as it is now known that the greater part of it is above sea level. However, the French, since 1856, have dug many artesian wells, striking water in abundance at a depth of 10 to 300 feet. Wherever these wells have been bored, date palm groves and orchards have increased in size, and the population has become greater. See Barth's *Travels in North and Central Africa*.

Saigon (*sī-gŏn'*), capital of French Cochin China, stands on the river Saigon, 60 miles from the sea. The present town has grown up since 1861, and is one of the handsomest cities of the east. The governor's palace, cathedral, and arsenal are among its fine buildings. Chinese, Anamese, and French make up the bulk of the population of 36,213, the suburb of Cholon, really a part of the city, having a population of 39,925. Saigon is the chief port between Singapore and Hong-Kong. There are in the colony 51 miles of railroad (from Saigon to Mytho). The main export is rice.

Sail. Sails are generally made of flax and hemp, but jute, cotton, and linen are also used, while savages make them of matting and vegetable fibers. Sails are stretched by means of masts, yards, booms, gaffs, and ropes. A vessel of shallow draught or of narrow beam can bear little sail, while a vessel of deep draught and heavily ballasted, as a yacht, or a vessel of great breadth of beam, can carry large sail. A sail acts with greatest power when the wind is right astern, but it can be applied with less strength when on either beam. In the latter case the force of the wind is divided into two parts, one part tending to make the ship go forward, the other tending to make it go sideways, but from the shape of the vessel this second force causes little motion; any that it does cause is called leeway. The sails which are set square across the ship are nearly square in shape, and are called square sails. But many which are set parallel with the keel, called fore-and-aft sails, are also four-sided. Others are three-sided, as stay sails, which are suspended from the ropes which stay the masts. The larger sailing vessels usually carry both fore-and-aft and square sails. The schooner has mainly fore-and-aft sails. The brig is mainly square-rigged, and the brigantine is a cross between the brig and the schooner. The cutter is a fore-and-aft one-master. The ordinary sails are mentioned under YACHT.

St. Albans (*al'banz*), a town of Hertfordshire, England, famous for its Benedictine abbey, which was founded by Offa, king of Mercia, in 793. Cardinal Wolsey was its greatest abbot. It contains the tomb of the early traveler, Sir John Mandeville. In St. Michael's church is Lord Bacon's monument. Here were fought two battles during the War of the Roses. Population 14,000.

St. An'drews, a Scottish town, stands on St. Andrew's bay, 42 miles northeast of Edinburgh. St. Rule's tower, the Bishop's castle, noted for its "battle-dungeon," and within whose walls Cardinal Beaton was slain, and the cathedral consecrated in the presence of Robert Bruce, here, are among the interesting buildings of Scotland. The schools of St. Andrews were well known in 1120, but the university, the first in Scotland, was not founded till 1411. It is now one of the smaller universities, but it is doing much for the higher education of women. The library has over 100,000 volumes, and there is a good museum. Population 7,853.

St. Augustine (*a'gŭs-tēn*), an old Spanish town on the east coast of Florida, stands on Matanzas sound, two miles from the Atlantic and thirty-seven miles southeast of Jacksonville. It was founded by Menendez, who built a fort here in 1565, and is the oldest town in the United States. It was several times attacked by the French, English, and Indians. A sea wall; a mile long, affords a fine promenade. The post office was once the residence of the Spanish governor, and the large barracks occupy an old Franciscan monastery. The old fortress of San Marco, now Fort Marion, was built by Indian slaves, who worked on it for more than a century. Besides its quaint Spanish lanes and balconied buildings, crumbling gates, and magnolias, palms, and oleanders, it has the most costly and magnificent hotels in the world. Two of these, the Ponce de Leon and the Alcazar, are massively built of shell concrete, with towers, casinos, and courtyards; a third is the Hotel Cordova. Its attractive drives, its yachting, and, above all, its climate, bring to it thousands of northern visitors. Population 4,272.

St. Bernard (*sānt bĕr'nard*), the name of two passes in the Alps. Great St. Bernard is 8,120 feet high. Almost on its crest stands the celebrated hospice, founded in 962 by Bernard de Menthon, a neighboring nobleman, for the benefit of pilgrims journeying to Rome. Now a telephone tells the Monks

when travelers are on their way up the mountain. These dozen monks, all young and strong, with the aid of large dogs — no longer the famous St. Bernard dogs, but Newfoundlands — rescue travelers who are in danger of perishing from the snow and cold. There is a botanical garden for Alpine plants on the northern slope of the pass. It was this pass over which Napoleon marched his army. Little St. Bernard is the pass used by Hannibal when he led his troops into Italy. It also has a hospice, 7,143 feet high.

St. Ber'nard Dog. See DOG.

St. Clair', a river of North America, in the line of the Great Lakes, carrying into Lake St. Clair the waters of Lake Huron, at the rate of 225,000 cubic feet per second. It is over 40 miles long and half a mile broad. In 1891, a railroad tunnel under its bed was finished between Port Huron, Mich., and Sarnia, Ont., including approaches 11,553 feet long.

LAKE ST. CLAIR is 26 miles long and 25 wide. From its southwest end passes the volume of water it has received into Lake Erie by means of the Detroit river.

St. Cloud (*san-klō'*), a French town near the Seine, ten miles west of Paris. , St. Cloud was long famous for its fine castle, built by the brother of Louis XIV., the Duke of Orleans. It was afterward a favorite palace of Napoleon. It was destroyed during the siege of Paris, in 1870. Population 6,000.

St. Croix (*kroi*), called also the Passamaquoddy and the Schoodic, a river flowing out of Grand lake, on the eastern border of Maine, runs southeast seventy-five miles to Passamaquoddy bay. It forms part of the boundary between the United States and New Brunswick. It is navigable to St. Stephen, twenty miles from its mouth.

St. Cyr (*san sēr'*), a French town two miles west of Versailles. A school for poor girls was founded here by Louis XIV., and it was for its pupils that Racine wrote his tragedies, *Esther* and *Athalie*. In 1806, Napoleon founded in its place the military school of St. Cyr, one of the most famous in the world. Population 3,500.

St. Denis (*san dā-nē'*), a noted French city, is four miles north of Paris, within the line of forts forming the outer defenses of the capital, and was itself formerly fortified. A famous fair has been held here since 1552. The abbey of St. Denis was the burying-place of the kings of France. The finest of the tombs are those of Louis XII. and his queen, Anne of Brittany, Francis I., Henry II., and Catherine de Medici. Napoleon turned the abbey into a school for the daughters of officers of the Legion of Honor. During the French Revolution the tombs were demolished and the bodies cast into ditches. Population 54,432.

St. Ell'as, Mount, a great volcanic mountain in Alaska, near the Canadian boundary line. It was long thought to be the highest mountain on the American continent, but is now known to be surpassed by Mt. Logan, 26 miles northeast of St. Elias, by Mt. McKinley in Alaska, and Mt. Orizaton in Mexico. Its height as determined by the United States Geodetic survey is 18,100 feet. It is covered almost from base to top with never-melting snow. There are huge glaciers, precipices, and chasms, which make the peak hard to climb. It was ascended in 1897 by Prince Louis Amadeus, of Savoy, and party.

St. Etienne (*san-ta-tyen'*), a large manufacturing city of France, stands on a branch of the Loire, 36 miles southwest of Lyons. It is in the midst of the second largest coal field in France, from which are taken 3,000,000 tons of coal a year. The art gallery, school of mines, and museum are the chief institutions. There is a large national gun factory, which since the revolution has furnished nearly all the muskets, rifles, and revolvers for the army. Steel and iron plates, guns, armor, iron masts, machinery castings, locks, cutlery, ribbons, and laces are the chief manufactures. The coal mines have been worked since the 14th century. The two first French railroads were built from St. Etienne. The town was captured twice by the Huguenots, and has suffered three terrible plagues. Population 136,030.

Saint-Evremond (*san-tāvr-mōn'*), Seigneur de, a famous French writer and wit, was born at St. Denis, Normandy, April 1, 1613. He was taught by the Jesuits, became a soldier, and fought well at Rocroi, Freiburg, and Nördlingen. He supported the throne, but in 1661 had to flee to Holland and then to England, on the discovery of a witty letter he had written on the subject of a treaty. There he spent the rest of his life as a wit, courtier, and warm friend of Charles II. His writings were famous long before they were published. More a man of fashion than an earnest writer, he is yet one of the masters of French style. His works include essays, letters, comedies, etc. He died in England, Sept. 29, 1703.

Saint Gaudens (*gaw'denz*), **Augustus,** American sculptor, was born at Dublin, Ireland, March 1, 1848, and came in his infancy to New York. Here he learned the trade of a cameo cutter, and studied drawing at the Cooper institute and later at the National Academy of Design. From 1867 to 1872 he pursued his artistic studies at the École des Beaux Arts, at Paris, and at Rome, where he produced his first sculptured figure, *Hiawatha*. Returning to New York, he opened a studio and produced a number of busts, statues, and emblematic subjects. The more prominent of these are his statues of Abraham Lincoln, Admiral Farragut, William M.

Evarts, Gen. W. T. Sherman, John A. Logan, Robert R. Randall, Theodore D. Woolsey, and other memorial sculptures, portrait-busts, bas-reliefs, tablets, etc. Also notable are his figure pieces—*The Puritan*, *Diana* (on the tower of Madison Square garden, N. Y.), and the fine bas-relief in St. Thomas' church, N. Y., entitled *Adoration of the Cross by Angels*. Effective also is his *Shaw Memorial* tablet in Boston Common.

St. Germain (*sĕr-măn'*), a famous French city on the Seine, 13 miles east of Paris. A fine terrace, built in 1672, runs along the river in front, and behind it is a royal forest of 10,000 acres. The old royal castle was the favorite residence of the kings of France until Louis XIV. moved the court to Versailles. Population 15,997.

St. Gotthard (*sănt'gŏth'ärd*), a mountain knob of the Alps, 9,850 feet high. Here are the sources of the Rhine, Rhône, Ticino, and Reuss, whereby St. Gotthard sends its melted snows to the German ocean, the Mediterranean, and the Adriatic. Across its shoulder runs one of the famous passes from Switzerland to Italy, 6,936 feet high. Near the top stand two hotels and a hospice for the 12,000 travelers who use the pass every year. Now most of the traffic goes through the tunnel, finished in 1880, which is 9¼ miles long, and cost $11,350,000, while the whole cost of the St. Gotthard railroad was $45,400,000.

St. Helena (*he-lē'nä*), a lonely island in the Atlantic, 1,200 miles from the west coast of Africa, covering 47 square miles. It is a part of an old volcano; and High hill is 2,823 feet above the sea. Its shores are cliffs, from 600 to 2,000 feet high, cut by deep, narrow valleys. The people, who number 5,000, raise potatoes, and fish for whales. The Suez canal destroyed a large trade with vessels which stopped on the way to and from India, by the Cape of Good Hope. The chief trade now is the export of the produce of the whale fisheries to the United States. St. Helena was discovered by the Portuguese in 1502, and taken possession of by the British East India company in 1651. The island is chiefly noted as the place of Napoleon's imprisonment from 1815 to his death in 1821. His home was the farmhouse of Longwood, three miles inland from the capital, Jamestown. Many Boer prisoners were sent here during the war in South Africa (1899–1901). See Melliss' *St. Helena*.

Saint-Hilaire (*san-tē-lĕr'*), **Geoffroy, Etienne,** a French naturalist, noted for his work in comparative anatomy, and for his connection with the theory of evolution. He was born at Étampes, France, April 15, 1772, and died at Paris in 1844. He was educated as a priest, but developed such a passionate fondness for zoology, that he deserted the ministry and became attached to the Museum of Natural History at the Jardin des Plantes. Here he was associated with Cuvier and Lamarck. He became professor of zoology, and devoted himself mainly to the study of vertebrates. He published works on the structure of animals and on the philosophy of anatomy. In 1803, he was given the badge of the Legion of Honor, and in 1807 was elected to the Institute. He reached the conclusion that there was a unity of plan in the construction of all animals, and he accounted for the origin of different animals through the changes produced in them by the surrounding conditions. As an evolutionist he sided with Lamarck against Cuvier, who believed in the fixity of species. (See EVOLUTION.) He was, however, more nearly a follower of Buffon than of Lamarck. In 1830, just after the death of Lamarck, he engaged in a controversy with Cuvier, before the Institute, on the unity of type and the evolution of animal life. This debate was so famous that it stirred all intellectual Europe. Cuvier won by his great authority and the more skillful management of his side of the case. He was in part right, but as regards the evolution of animal life, all later evidence is against him.

St. James' Palace, a large brick building, fronting toward Pall Mall, London. At first a hospital, it was made a royal manor by Henry VIII. Here died Queen Mary, and Charles I. slept here the night before his execution. When Whitehall was burned in 1697, St. James became the regular London palace of the English sovereigns and so continued until the late Queen Victoria removed the royal household to Buckingham palace in 1837. The Court of St. James is a name often given to the British court.

St. John, a river rising in Maine, and after a course of 450 miles falling into the bay of Fundy by an inlet five miles wide. It is navigable for small craft for 155 miles to Woodstock. Through most of its upper course it forms the boundary line between Maine and Canada.

St. John, the capital and largest city of New Brunswick, is on the inlet of the St. John river, 277 miles northwest of Halifax. It has a good harbor, and steamers ply to and from Boston. Shipbuilding, timber trade, and fishing are carried on, and there are important manufactures. The greater part of the city was destroyed by fire in 1877, but has since been rebuilt. Population 40,711.

St. John of Jerusalem, Knights of, a celebrated military and religious order of the middle ages, was founded about 1048 in a hospital built by merchants of Amalfi at Jerusalem for the care of pilgrims to the Holy Sepulchre. After the conquest of Jerusalem by the Crusaders in 1099, the hospital servants were joined by many from the Christian army, who resolved to devote themselves to the service of poor and sick pilgrims. They soon

became an order, which was military as well as religious, their chief undertaking being the protection of pilgrims on their way to Jerusalem. For this purpose commanderies were set up in the Mediterranean towns, and the members of the order became known as Hospitallers. Saladin forced them to retire to Acre in 1191, the last Christian stronghold in Palestine, which they held with great bravery for a century, but then after a terrible siege were compelled to sail to Cyprus. In 1310, the knights captured Rhodes and seven neighboring islands from the Greek and Moslem pirates, and for over 200 years waged successful war against the Turks. In 1523, Sultan Solyman captured Rhodes, and after a short stay at Crete, Charles V. gave the Hospitallers the island of Malta, with Tripoli and Gozo. In 1565, the Corsair Dragut, after capturing Tripoli, laid siege to Malta, and at the end of four months was beaten off with a loss of 25,000 men. By 1798, the order was of little importance, and Malta was surrendered to the French. Certain branches are still kept up in Europe.

In the 12th century a bitter rivalry sprang up between the Hospitallers and the Knights Templar, which was fought out in 1259, the former being victorious. On the suppression of the Knights Templar, in 1312, their 9,000 manors in different parts of Europe were added to the 19,000 already possessed by the Hospitallers. The brethren were divided into three classes, knights, chaplains, and serving brothers, these last being fighting squires who accompanied the knights on their expeditions. The Hospitallers wore a red coat over their armor; their badge was a maltese cross, enameled white and edged with gold; their motto was *pro fide*, to which was afterward added *pro utilitate hominum* ("for the faith and for the service of men").

St. John's, capital of Newfoundland, is on the east coast of the island, 1,076 miles northeast of Montreal, and is the nearest port in America to Europe, being only 1,730 miles from Cork. It has a good harbor, two railroads, and a number of manufactures. Population 29,007.

St. Jo'seph, a city of Missouri on the Missouri river, 110 miles above Kansas City. Eight railroads center here, and the river is crossed by an iron railroad bridge which has five spans, one a draw span of 365 feet, and which cost $1,500,000. Here are the state insane asylum, and St. Joseph college. The stockyards cover 440 acres, and a yearly jobbing trade of $150,000,000 is done. There are also gun, carriage, stove, ironwork, clothing, and other manufactures. An Indian trader laid out the town in 1843, and it soon became famous as a starting point for the long journey in wagons across the plains. Its area is seven square miles. Population 102,979.

Saint-Just (*sän-zhüst'*), **Louis Antoine de,** French revolutionist, was born at Décize, France, Aug. 25, 1767. While studying law at Rheims he was captivated by Rousseau's writings, and, in order to become a writer, set off to Paris at nineteen, taking some of his mother's plate, and was, at her request, imprisoned for six months. His essay *The Spirit of the Revolution*, gained him some standing, and as a member of the convention he attracted notice by his fierce tirades against the king, and by his making the opening speech on the verdict at his trial. As a follower of Robespierre he began the attacks on Hébert, which sent him to his doom, quickly followed by the fall of Danton. Saint-Just fell with Robespierre, but unlike him, carried his head high on the tumbrel, and died without a word, July 28, 1794.

St. Law'rence, a great North American river, which, issuing from Lake Ontario, flows northeast for 750 miles — part of the way forming the boundary line between the United States and Canada — and falls into the gulf of St. Lawrence by a broad inlet. In reality, the St. Lawrence includes the Great Lakes and their connecting streams, with a length of 2,200 miles, these lakes being a great system of river valleys whose old outlets have been blocked. The St. Lawrence system is the largest body of fresh water on the globe. The system begins with the St. Louis, which rises in the same plain which sends forth also the Mississippi and the Red River of the North. The St. Lawrence proper has a number of expansions, as the lake of the Thousand Isles, lake of St. Francis, lake of St. Peter, etc. The channel has been deepened and widened between Quebec and Montreal. Between Montreal and Lake Ontario there are rapids, around which canals have been dug. Of its branches the Richelieu brings the waters of Lake Champlain; others are the Ottawa, St. Maurice, Saguenay, and Batiscan. The width of the St. Lawrence varies from one to four miles, while the inlet at its mouth is over 100 miles across. During the winter the river is frozen over.

St. Law'rence, The Gulf of, washes Newfoundland, Quebec, New Brunswick, and Nova Scotia. It is joined to the Atlantic by the strait of Belle Isle, between Newfoundland and Labrador; the gulf of Canso, between Cape Breton and Nova Scotia; and by a wider passage than either between Cape Breton and Newfoundland. The main islands are Anticosti, St. Paul's, and Prince Edward's. The gulf is noted for its fisheries.

St. Louis (*sānt lō'is*), **Mo.,** the chief city of the Mississippi valley, and the fourth of the United States, is in Missouri, on the west bank of the Mississippi river, 21 miles south of the mouth of the Missouri. The city stands many feet above the river, built on three terraces, the third terrace being 200 feet high. It has a river frontage of 19 miles, and covers 62½

square miles. Water is taken from the Mississippi river, the water works having a capacity of 50,000,000 gallons daily, which will soon be doubled. Only electric lighting is used; and there are cable, electric, and horse railroads. Eighteen railroads enter the new union depot, and an electric railroad is being built between St. Louis and Chicago. The Eads bridge over the Mississippi was opened in 1874, and is 1,524 feet long. The Merchants' steel bridge, opened in 1890, is 2,450 feet long, including approaches.

Among the fine public buildings are the new city hall, costing over $1,500,000, the exposition building, four courts, the merchants' exchange, courthouse, Union Trust building, Equitable building, Southern and Planters' hotel, the United States arsenal, Roman Catholic cathedral, and St. George's church (Episcopalian). The public squares and parks occupy over 3,000 acres. Forest park is the largest, containing 1,372 acres; Tower Grove park, in which is a botanical garden, is one of the finest in the country. The exposition is open every fall, and is one of the best yearly fairs in the United States.

St. Louis spends over $1,500,000 a year on its public schools, which are attended by 80,673 pupils. St. Louis university has 34 professors and 435 students; its buildings are new, and it has a library of 25,000 volumes. Washington university includes a college, polytechnic school, law school, school of botany, and school of fine arts; it has 104 professors, and 1,450 students. The museum of fine arts is housed in a handsome building. The chief libraries are the public school library (75,000 volumes) and the Mercantile library (68,000 volumes).

St. Louis' growth is due to its river trade, though now it is equally important as a railroad center. It receives over 10,000,000 tons of freight yearly, and ships over 6,000,000 tons. It manufactures more tobacco than any city in the world; its other chief manufactures are beer, and boots and shoes.

In 1764, a company of merchants headed by Pierre Ligueste Laclède, who had been given by the director-general of Louisiana the right to trade with the Indians on the Missouri, made a settlement at St. Louis. It was taken possession of by Spanish troops in 1768 and with the rest of Louisiana became a part of the United States in 1803. In 1780, it was attacked by a large body of Indians, who were driven off. For many years it was only a trading post for the fur traders. The first newspaper was started in 1808; and a year later it became a town. The city suffered from cholera in 1832, and from cholera and fire in 1849. In 1896, St. Louis was visited by a cyclone which swept through the heart of the city, causing great loss of life and destroying property to the value of from $25,000,000 to $50,000,000. Population 575,238. See Billon's *Annals of St. Louis in Its Early Days.*

St. Lou'is, capital of the French colony of Senegal in West Africa, is on a small island near the mouth of the Senegal river. Bridges join it to suburbs on either bank. A sand-bar makes the river mouth dangerous to vessels, and freight is landed at Dakar on Cape Verde, 100 miles southwest, and brought to St. Louis by rail. Still the place has a trade of $5,000,000 a year, its chief exports being gums and earth-nuts. The climate is unhealthy; water is brought to the town by an aqueduct seven and one-half miles long. Population 20,200.

St. Ma'ry's Strait or **River** connects Lake Superior and Lake Huron, and forms the boundary between Ontario and the Upper Peninsula of Michigan. The strait is sixty-three miles long. One mile below Lake Superior are the rapids called the Sault Ste. Marie, below which it spreads out into a broad lake. These rapids have a fall of 20½ feet, around which a canal has been built, most of it cut through solid rock.

St. Paul, capital of Minnesota, is on both banks of the Mississippi, near the mouth of the Minnesota. The city is built on two high plains of limestone rock; the business portion is on the lower plain, and most of the best residences are on the upper plain overlooking the Mississippi, one of the finest streets of which is Summit avenue. Its buildings compare well with those of any city in the country. Among them are the state house, city hall, chamber of commerce, Convent of the Good Shepherd, and the New York life insurance building. The manufacturing output amounts to $52,000,000 a year, and the stockyards do a business of $10,000,000. St. Paul is served by ten railroads, and electric railroads carry passengers to all parts of the city. Twenty-five thousand pupils attend the public schools which are maintained at an annual cost of $465,000; there are three colleges, Macalester college (Presbyterian), Hamline university (Methodist), and St. Thomas college (Roman Catholic). The city library has 50,000 volumes.

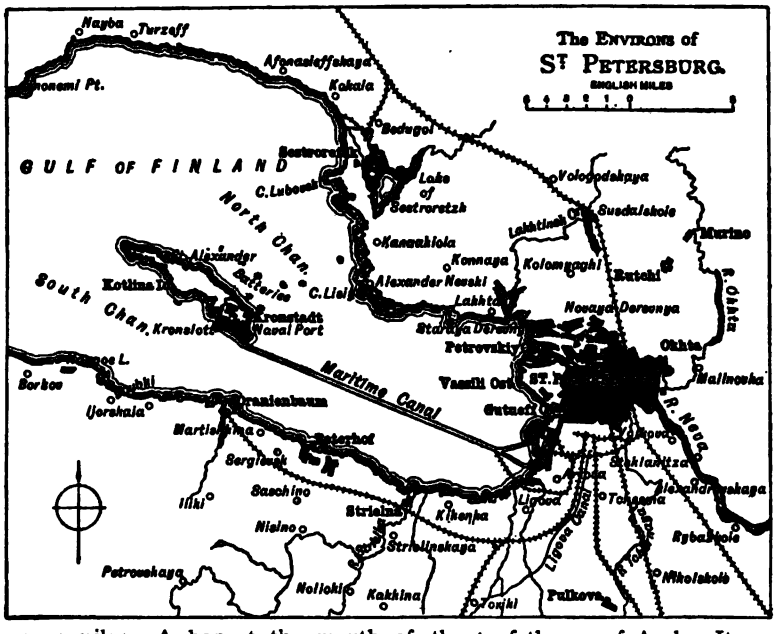
The first log huts were built in 1840 on the site of St. Paul by Canadian voyagers, who were engaged in the fur trade. In 1849, when St. Paul was made the capital of the newly organized Minnesota territory, the town had but 500 inhabitants. Its present population is 163,065, more than three-fourths of which is the growth of the last 20 years. St. Paul and Minneapolis are known as the twin cities, and have been growing steadily toward each other, so that they are now practically one city, with a combined population of 365,783.

St. Pe'tersburg, the capital of the Russian empire, stands at the head of the gulf of Finland, at the mouth of the Neva. It is built on flat and low marshy ground, from which the sea is slowly receding, the Neva dividing into many branches, thus producing 100 islands, which are all the time getting

larger. In this way nearly 600 acres have been added to St. Petersburg in the last 150 years. High winds sometimes raise the sea level and flood the poorer parts of the city. In 1777, 1824, and 1891 rises of ten or more feet covered nearly the whole city with water. St. Petersburg is surrounded by wildernesses, the nearest city being Novgorod, and is almost wholly cut off from the rest of Russia. The chief connection is by railway and by the Neva, which is joined by canals with the Volga, and so is the real mouth of Russia's greatest river. Founded by Peter the Great in 1702, the city has spread over the banks and islands of the Neva and now covers 42 square miles. A bar at the mouth of the river made Kronstadt, on an island 16 miles west, the real port, but the building of a ship canal, twenty-two feet deep, now allows ships to unload within the city itself. Most of and the finest part of the city is on the mainland, bordered by a granite quay, with a long line of palaces and mansions stretching along the Neva for 2½ miles. The old Admiralty with its gilded spire is the center of the main part of St. Petersburg. From it starts the Nevskiy Prospect, one of the finest streets in the world, not so much for its houses as for its great width and length, its crowds and carriages. To the east of the old Admiralty rises the huge and magnificent mass of the Winter Palace. On the island of Vasilievsky is the stock exchange, the university, the academy of sciences, and the academy of arts. On the Petersburgskiy island stands the old fortress of St. Peter and St. Paul, containing the mint, the cathedral, in which the members of the imperial family are buried, and a political prison. Many islands are joined by bridges and covered by beautiful parks and summer houses.

The chief manufactures are cottons, metals, leather, sugar, and guns. But St. Petersburg owes its growth chiefly to foreign trade. Thousands of boats and rafts bring 3,000,000 tons of freight down the Neva yearly, while the railroads bring 1,260,000 tons.

The St. Petersburg university, and the many medical, technical, engineering, naval, military, and other schools, as well as the Ladies' university, number several thousands of students. There are fine picture galleries in the Academy of Arts and the Hermitage. The imperial public library has 1,200,000 volumes and 40,000 manuscripts Population 1,267,023.



Saint-Pierre (*săn'pē-ĕr'*), **Jacques Henri Bernardin de,** was born at Havre, France, Jan. 19, 1737. As a boy he made a voyage to Martinique, and studied at Caen and Rouen. He worked for a while as an engineer, made voyages and journeys, was a disciple of Rousseau, and wished to found an ideal state on the shores of the sea of Aral. It was not till 1771 that his first book appeared, *Voyage to the Isle of France*, which at first was hardly noticed. He is remembered chiefly as the author of the beautiful story of *Paul and Virginia*, which was quickly scattered over Europe, in English, Italian, Spanish, Dutch, Polish, and Russian translations. Napoleon took it with him on his Italian campaign, re-read it at St. Helena, and heaped many favors on St. Pierre, which enabled him to spend his old age comfortably among his flowers at his country house at Éragny. Here he died Jan. 21, 1814.

St. Quentin (*săn kŏn-tăn'*), a French city on the Somme, ninety-five miles northeast of Paris. The church of St. Quentin and the town hall are fine Gothic buildings. There are large cotton and other mills, and vast quantities of embroidery are made. Two important battles were fought here. Spanish and English troops won a victory over the

French under Montmorency in 1557, followed by the surrender of the city to the Spaniards, though bravely defended by Coligny. On Jan. 19, 1871, the Germans under Von Goeben defeated the French under Faidherbe, capturing nearly 10,000 prisoners. Population 48,868.

Saint-Simon (*sānt-sī'mon*), **Claude Henri,** Count of, the founder of French socialism, was born at Paris, Oct. 17, 1760. He was odd and ambitious as a young man, and ordered his servant to wake him every morning with the words, "Rise, Monsieur le Comte; you have great things to do." Like other French nobles he showed his love for liberty by serving as a volunteer in the American Revolutionary war. However, he took very little part in the French Revolution, except to undergo a short imprisonment. His ancestor, Charlemagne, appeared to him in a dream and encouraged him to devote his life to philosophy, promising that his successes as a philosopher would equal those of the emperor as a warrior and statesman. His first work was *Letters of a Citizen of Geneva to His Contemporaries*. His last and most important was *New Christianity*. Both he and his writings attracted many of the brightest and ablest young men of France, including Comte and Augustin Thierry. He suffered hardships from lack of means, often being without decent clothes and food. This poverty caused him to try to shoot himself, in which attempt he lost an eye, two years before his death, May 19, 1825.

Saint-Si'mon, Louis de Rouvroy, Duke of, was born at Paris, Jan. 16, 1675. He served as a soldier in the wars of Louis XIV. and took a leading part as courtier and politician at that monarch's court. He is remembered for his *Memoirs*, which were not published in full till 1830. They are a masterpiece of art and are said not to be equaled by any work of the kind yet written. His aim, in which he succeeded, was to make his reader think "not that he is reading a history or memoirs, but rather that he is himself in the secret of all that is represented to him, and spectator of all that is related." He died at Laferté, March 2, 1755. See Henry Reeve's *Royal and Republican France*.

St. Vin'cent, Cape, forms the southwestern corner of Portugal, off which two important battles have taken place. On June 16, 1693, the French fleet defeated the English Admiral Rooke, who lost 12 men-of-war and 80 merchantmen that were sailing under his convoy. On Feb. 14, 1797, the well-known battle of Cape St. Vincent was fought, in which Earl St. Vincent, ably seconded by Lord Nelson, with 15 sail of the line and 7 frigates, defeated the Spanish with 27 sail. This victory prevented the invasion of England by France.

Sainte-Beuve (*sant'bev'*), **Charles Augustin,** the greatest literary critic of modern times, was born at Boulogne-sur-Mer, France, in 1804. His father died before his birth and his mother had a hard struggle to find means to give her son a schooling. At fourteen, Charles went to the college Charlemagne at Paris, and afterward studied medicine. In 1824, he began his career as a writer, as a regular contributor of the *Globe*, a paper started in that year by one of his college professors. A review of Victor Hugo's *Odes and Ballads* made him a lifelong friend of that poet. His best work as a critic began in 1840, in which year he was made keeper of the Mazarin library. In 1849, he began to write, for the *Constitutionel*, an article on some literary subject every Monday, and this was his work for twenty years. These *Monday Talks* fill twenty-eight volumes, and on them his fame chiefly rests. Sainte-Beuve died at Paris, Oct. 13, 1869.

Sais (*sā-is'*), an old Egyptian city, on the right bank of the Canoptic branch of the Nile. It gave its name to two Egyptian dynasties, the 24th and the 26th, founded by natives of the city. Sais was important as a religious capital, and had a famous temple of the goddess Neith and the tomb of Osiris. Toward the close of the monarchy it rose to great splendor. The 26th dynasty made it the capital of the kingdom. It was also a renowned seat of learning, and was frequently visited by Greek sages. The legend of the mysterious veiled statue in the temple at Sais formed the subject of one of Schiller's ballads.

Saki (*sä'ke*), a kind of beer which the Japanese make from rice. It is the common drink of Japan. It is clear, and tastes unpleasant to Europeans. It is usually drunk hot, out of flat cups or lacquered wood saucers.

Saladin (*säl'a-din*), the name given by western writers to Salah-ed-din Yusuf ibn Ayub, the sultan of Egypt and Syria. He was born in 1137 at the castle of Tekrit, on the Tigris, of which his father, a Kurd, was governor under the Seljuk Turks. He entered the service of the emir of Syria, and went on several expeditions to Egypt in company with his uncle, who was general of the emir's army. He rose to be grand vizier and in 1171 master of Egypt, overthrowing the reigning caliph. Three years later, the emir died and Saladin proclaimed himself sultan of Egypt and Syria, which title was confirmed to him by the caliph of Bagdad. He next conquered Mesopotamia and received the homage of the Turkish princes of Asia Minor. He then turned his attention to the Christians, utterly defeating them near Tiberias in 1187; next Jerusalem was stormed (Oct. 3), and almost every other fortified place on the Syrian coast was taken. The news of this great success aroused the Christians of western Europe, and a power-

ful body of crusaders, headed by the kings of France and England, soon appeared on the scene of strife. They captured Acre in 1191, and Richard Cœur-de-Lion defeated Saladin, took Cæsarea and Jaffa, and obtained a treaty for three years by which the coast from Jaffa to Tyre was yielded to the Christians. The next year Saladin died at Damascus, March 3, 1193. Saladin was not merely a great soldier; his wise government left traces which lasted for centuries in the citadel of Cairo, and in canals, dikes, and roads. He lives in history as the Moslem hero of the third crusade, and as the Moslem ideal of chivalry. The chivalrous side of his character is seen in Scott's *The Talisman*.

Salaman'ca, a Spanish city on the Tormes, 110 miles northwest of Madrid. From the 13th to the end of the 17th century it was the seat of one of the most renowned universities in Europe. In the 16th century there were from 6,000 to 8,000 students; now there are some 1,200. The library contains 70,500 volumes. The city, which once had a population of 50,000, is still surrounded with walls, pierced by ten gates. Its houses, convents, churches, streets, and squares preserve much of their appearance during the middle ages. The great square was used for bullfights, and can hold 20,000 spectators. The town was captured by Hannibal in 222 B. C. The Moors were driven out of it in 1055. The French captured it in 1812. Population 24,000.

Sal'amander, a tailed amphibian, with a body shaped like a lizard and often mistaken for one of those reptiles. The group includes

COMMON MUD PUPPY, WITH EXTERNAL GILLS.

mud puppies, newts, and the like. They are abundant in many places in both the Old and the New Worlds. Several kinds of *Amblystoma* are very common in the United States. The commoner forms are six to eight inches long. They have blunt noses, and are dark colored with yellow spots and blotches. They lay their eggs in quiet waters, preferring small ponds in which the water is easily warmed. The eggs are hatched into tadpoles, with external gills. These grow to a length of five or six inches before the gills are dropped and replaced entirely by lungs. The adults live on land, going into the water to lay eggs. Some salamanders, like the Mexican axolotl, and the common mud puppy (*Necturus*), live habitually in the water and retain their external feather-like gills throughout life. The salamanders are divided into those which retain and those which lose their gills. Most salamanders lay eggs, but one form (*Salamandra atra*) living on the Alps, brings forth living young. Though regarded with fear by many people, the salamanders are harmless.

Salamis (*sal'a-mis*), **Battle of.** This great naval battle was fought between the Greeks and the Persians in 480 B. C., a few days after the battle of Thermopylæ, in the narrow strait between the island of Salamis and the coast of Attica. The Greek fleet of 366 triremes was drawn up at the entrance of the bay forming the harbor of the town of New Salamis, the Athenians under Themistocles, the Corinthians under Adimantus, while the Spartan Eurybiades commanded the whole. Quarrels among the Greek leaders would probably have caused the fleet to break up, had not Themistocles by a stratagem got Xerxes, the Persian king, to bring up his fleet and give battle at once. Xerxes drew up his fleet, numbering 1,200 triremes and 3,000 smaller vessels, during the night before the battle, so as to block up both entrances to the strait. Sure of victory he took his seat on a throne set up on a lofty height on the Attic coast. Both Greeks and Persians fought with great bravery, but the latter were defeated, the Greeks being victorious in one of the most important sea-fights of history.

Sa'lem, a city in the south of India, 120 miles southwest of Madras. It stands in a valley backed by hills. It has large cotton mills, and a good general trade. Population 67,750.

Sa'lem, city, settled 1626, chief county-seat of Essex county, Mass., on the Boston and Maine railroad, Eastern Division, 17 miles by rail northeast of Boston. Its harbor, an arm of Massachusetts bay, is well sheltered and commodious, but of insufficient depth for the largest vessels. The city is a popular resort for people interested in antiquities of early American settlements, possessing, as it does, many historic localities and buildings. The Essex institute contains a large collection of relics and portraits and a library of 82,850 volumes and 285,922 pamphlets and serials, many of which treat of historic subjects. The East India Marine museum has a rare ex-

hibit of ethnological value and many other objects of varied interest. The Athenæum contains a library of 25,000 volumes, and the free public library has upward of 40,000 volumes. Besides a well-sustained system of public schools, it has three parochial schools and is the seat of a flourishing state normal school. It has twenty-one churches, a Y. M. C. A. organization, with a fine, large building, and an endowed institution for work among boys, known as the Salem Fraternity.

The city has been somewhat unjustly identified with the witchcraft delusion of 1692 from the fact that the courts sat here at which the accused were tried. The recovery from this delusion was earlier here than in other parts of this country or in England.

The city formerly enjoyed a large and extensive foreign commerce. This has become superseded by an extensive coasting trade, of which the reception of coal for distribution by rail and the shipment of ice form the chief items. Population (1901), 35,956.

Sa'lem, capital of Oregon, is on the Willamette river, 52 miles southwest of Portland. It has good water-power and some manufactures. Here are the state capitol, penitentiary, insane asylum, and schools for the blind, deaf and dumb, besides Willamette university (Methodist). Salem was settled in 1834, and became the state capital in 1860. Population 4,258.

Salerno (*sä-lĕr'no*), a city of southern Italy, on the gulf of Salerno, 33 miles southeast of Naples. An old Norman castle surmounts the hill behind the city. The beautiful Gothic cathedral of St. Matthew has in front of it a quadrangle of porphyry and granite pillars. The city was celebrated in the middle ages for its university. Population 39,239.

Sal'ic Law, a collection of the popular laws of the Salic Franks, in which the succession to what are called Salic lands was confined to males, probably from the importance of getting military service from the chief landowners. This law was afterward applied to the succession to the French crown.

Salisbury (*sawlz'ber-i*), a cathedral city of England, stands near the Avon river, 84 miles southwest of London. Its famous cathedral is built in early English style, and is 473 feet long and 111 wide; the spire is the highest in England—400 feet. In the large close which surrounds the cathedral is the bishop's palace. The Blackmore museum contains a fine collection of American antiquities. Among the bishops have been Cardinal Campeggio, Jewell, Hooker, Fuller, Barrow, Liddon, and Wordsworth. Old Sarum, a mile north of the present city, was a castle and a place of importance in Roman times. Here Canute died, and here William the Conqueror gathered the barons to renew their oath of fealty. Population 17,362.

Salis'bury, Robert A. T. Gascoyne Cecil, Marquis of, P. C., English statesman and prime minister, was born at Hatfield, Herts, Feb. 3, 1830, and educated at Eton and at Christ Church, Oxford. In 1866 he entered Lord Derby's ministry as secretary of state for India (under the title of Lord Cranbourne). On the death of his father, in 1867, he entered the house of lords and took rank as the foremost debater in the upper chamber. In 1876, he acted as joint plenipotentiary of Great Britain at the conference of Constantinople, and two years later became secretary of state for foreign affairs. When the Earl of Beaconsfield died, in 1880, Lord Salisbury became the recognized leader of the Conservative party, and when the Gladstone ministry resigned, in 1885, he became premier and secretary for foreign affairs. Owing to feeble support received by his government he resigned affairs to Mr. Gladstone, but on the latter being defeated on the second reading of the Irish Home Rule bill, he was again returned to power. In 1892, Mr. Gladstone and he once more exchanged the premiership, and in 1895, on the resignation of Lord Rosebery, Lord Salisbury formed his third administration, in coalition with Liberal-Unionists, of which he is still (1901) the head. In 1864, he was elected chancellor of the University of Oxford. In his younger days, he was a contributor to the *Quarterly Review*, but now finds relaxation from the cares of office in his laboratory, where he dabbles in chemistry and electricity.

MARQUIS OF SALISBURY.

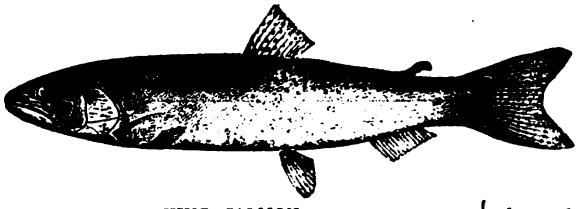
Saliva (*sa-lī'va*), one of the digestive fluids, is mainly the product of the salivary glands, of which there are three kinds, named from Greek and Latin words denoting their position—the parotid, the submaxillary, and the sublingual, with ducts or canals which carry the saliva into the mouth. Here it is mixed with mucous, from the mucous membrane lining the mouth, forming ordinary or mixed saliva. The parotid gland is the largest of the three glands, found on each side. It lies on the side of the face just in front of the ear. Its duct is about two and a half inches long and opens into the mouth opposite the second molar tooth of the upper jaw. The submaxillary gland is below the jaw bone, the sublingual gland is under the tongue on the floor of the mouth. Salivary glands are found in most of the higher animals except fishes.

Sallee', a seaport of Morocco, stands on the Atlantic, at the mouth of the Bu-Rakrak. It

was for centuries notorious as a haunt of pirates, who carried the terror of their name far and wide, and who are known to every reader of *Robinson Crusoe*. The people, 10,000 in number, allow no European to dwell within their walls, though a stop was put to their piracy at the beginning of the 19th century. Population about 10,000.

Sal'lust, a Roman historian, was born of a plebeian family at Amiternum, in the Sabine country, 86 B. C. As a follower of Cæsar, he rose to be tribune in 52, and prætor five years later. He took part in Cæsar's African campaign, came near being killed in a mutiny of some of the troops, and was made governor of Numidia. This office enriched him, and enabled him to lay out beautiful gardens on the Quirinal which bore his name for centuries, and to build the palace used afterward by the emperors Nerva, Vespasian, and Aurelian. Here he wrote his famous histories, *Catiline*, *Jugurtha*, and the *Five Books of History*, of which last only a few fragments are known. Sallust died in 34 B. C.

Salmon (*săm'ŭn*), the name for several species of fish belonging to the trout family and ascending rivers to spawn. They are, of course, found abundantly during migration in fresh water, but as they feed mainly in salt water, they may be regarded as marine fishes. They occur on the shores of both eastern and western continents. They are essentially cold-water fish, in Europe ranging north of Spain, and on the eastern coast of North America, from Maine northward, being



KING SALMON.

sometimes found as far south as the mouth of the Hudson river. The salmon of the Pacific coast, so abundant in the Columbia and Yukon rivers, belongs to another genus. This kind is more tolerant of warm water and occurs on the coast and in rivers of California. The North Atlantic salmon is brownish above, with silvery sides, spotted with black. These spots are often in the form of a letter S. Its delicate reddish-orange flesh makes it highly prized as a table fish. The average weight of an adult is about fifteen pounds. Very similar forms are found in Great Britain, Europe, Norway, Russia, Eastern Asia, and Japan. The salmon of the western Pacific coast are larger. They ascend the Yukon river to a distance of 1,500 miles. The king salmon is the largest, and is known to reach a weight of 100 pounds, although those weighing 40 or 50 pounds are considered very large. The average weight is about 22 pounds. In migrating, they are able to leap over vertical water falls six or eight feet high, when there is considerable depth just below the falls, and they ascend swift rapids of much greater height. There are four other varieties on the Pacific coast associated with the king salmon, but all of smaller size. The young fish at first live in the fresh water and are called, successively, parr, smolt, and many other local names. Going into the salt water after one to three years with a length of six inches, they develop rapidly, and, in a few months, reach a weight of several pounds. They are now called grilse and return to fresh water to spawn. On going to the sea again after their first spawning, they are called salmon and thereafter bear that name. The most extensive factories for canning salmon are on the Columbia river. The fish canned in this region are shipped all over the world. In 1888, the value of the salmon canned in the Pacific states was $3,703,833. See Buckland's *Fish Hatching;* Traherne's *The Habits of the Salmon.*

Salonica (*să-lo-nē'ka*), the most important city for trade in European Turkey after Constantinople. It stands at the head of the gulf of Salonica, and since 1889 has been joined to Belgrade and Vienna by rail. It has a fine appearance from the sea, as it is surrounded by white walls five miles long, and its houses and mosques are shaded by dark-leaved trees, while a citadel, the old Acropolis, looks down from the rocky heights above it. The main buildings are the mosques, most of them now Christian churches; among them are St. Sophia, St. George, and St. Demetrius. The old mosque was once a temple of Venus. Here is the court of the hippodrome where Theodosius ordered the massacre of 7,000 citizens of Salonica. The Via Equatia, the high-road from Rome to Byzantium passes through the city. The trade of the port is steadily growing, especially since the opening of the railroad to Servia. Cotton, flour, soap, bricks, leather, silk, and carpets are manufactured. Salonica is the early Thessalonica of the Christians, to which St. Paul wrote the two epistles to the Thessalonians. At this city Cicero lived when he withdrew from Rome after putting down Catiline's conspiracy. The town was founded by Cassander in 315 B. C., who named it after his wife, sister of Alexander the Great. It was taken by the Moslems from Africa in 904, when they carried off 22,000 of its people into slavery, and by the Normans of South Italy in 1185. Then it went to the Venetians, who surrendered it to the Turks in 1430. Population, about 105,000, of whom nearly 61,000 are Jews of Spanish descent, 25,000 are Turks, and 14,000 Greeks.

Salt. Common salt is chloride of sodium (NaCl). It occurs in nature both in beds, or strata, when it is called rock salt; and in solution in water. Aside from the sea and salt lakes, the under-ground waters of many regions contain salt. The salt of commerce is partly mined from the beds of rock salt, and partly extracted from salt waters. In the latter case, the brine may be natural, as in the case of the sea, salt lakes, and certain salt wells; or artificial. In the case of artificial brines, fresh water is allowed to flow over beds of salt, and from the resulting solution salt is extracted. In the extraction of salt from salt water, two general processes are in vogue. In the one, the water is allowed to evaporate in the open air under the influence of the sun; and in the other, the evaporation is hastened by means of artificial heat. By the former process, the *coarse salt*, and by the latter, the *fine salt* of commerce is obtained. Beds of rock salt represent deposits from solution on the bottoms of salt lakes, lagoons, etc. In some lakes, such as Great Salt lake, such deposits are being made at the present time. Similar deposits have been made in the past, and subsequently buried by other sediments, such as sand, mud, etc. Some of these beds of salt were made millions of years ago. Some of them are hundreds of feet thick. The salt in solution in under-ground waters may have been derived from salt beds over which the waters seeping in from the surface have passed, and some of the natural brines may represent sea water with which the sediment was originally filled, and which has never been drained out.

The thickest salt beds of this country, so far as now known, are on the coast of Louisiana, on Avery's island (*Petite Anse*). Other salt beds occur in New York, Pennsylvania, Ohio, Michigan, and in the province of Ontario.

The output of salt in the United States in 1898 was 17,612,634 barrels (280 lbs. per bbl.). Its production by states was as follows:—

	BARRELS.
New York	6,791,798
Michigan	5,263,564
Kansas	1,882,329
Ohio	1,682,247
California	653,009
Utah	266,250
Texas	254,284
West Virginia	247,668
Pennsylvania	154,287
Other States	417,198

In spite of this great amount, and in spite of the fact that the United States produces more salt than any other country, over 178,000,000 pounds of salt were imported in 1898, and but 17,000,000 pounds exported.

Great Britain, Russia, Germany, France, India, Spain, and Italy are great producer of salt, in the order named. The total product for the world in 1897 was more than 11,000,000 short tons.

Salt Lake City, capital of Utah, is on the Jordan river, eleven miles from Great Salt Lake, and 4,265 feet above the sea. It covers twelve square miles and the city limits embrace fifty square miles. Its streets are 137 feet wide, shaded by fine trees, many of them freshened by streams of running water from the neighboring mountains, and are lighted by electricity. The finest public buildings are the Mormon temple, which cost $10,000,000, with walls built of blocks of dressed granite, twenty feet thick at the bottom, tapering to six feet thick at the top; the tabernacle, a huge building in the shape of an ellipse with a flat dome-shaped roof—something like a tureen cover—resting on sandstone pillars, and seating 9,000; the new assembly hall of rough-hewn granite, the endowment house, the city and county building, etc. But though Mormon influence is strong, there are also Roman Catholic, Episcopalian, Presbyterian, Congregational, and Methodist churches. St. Mark's cathedral (Episcopalian) is the finest Gentile church. The city is the center of large mining industries, and has smelting works, flour, woolen, and paper mills, foundries, machine shops, breweries, tanneries, etc. It has good public schools, supported at an annual cost of $250,000, with 272 teachers and 11,630 pupils. Here is located the University of Utah, a coeducational institution, supported by the state, having about forty instructors and over 500 students. Salt Lake City was founded in 1847 by Brigham Young, who with 142 picked men had spent three months hunting for a site for the future Mormon capital. The city has grown greatly because of the inflow of Mormon emigrants. Population 53,531. See Burton's *The City of the Saints;* Bancroft's *History of Utah.*

Salt'peter, or **Ni'ter,** is potassium nitrate (KNO_3). It is generally in long, colorless, six-sided prisms. Its taste is cooling and very salty. It dissolves in water but not in alcohol. Mixtures of niter and carbon or of niter and sulphur, or of all three, explode with great energy on applying heat. If saltpeter be thrown on glowing coals it flashes briskly. Niter is found in India and Persia, as a natural product, on the soil or scattered through the upper rocks. But most saltpeter is now made from the Chilean sodium nitrate. Niter is used in making sulphuric acid, nitric acid, fireworks, and especially gunpowder. It is also a medicine.

Sodium nitrate is found abundantly on the surface of the soil in Chile and Peru in the form of cube-like crystals, and so is often called cubic niter. Besides its use in the manufacture of saltpeter, it is a valuable fertilizer. In 1889, 930,000 tons of this nitrate, or Chilean saltpeter, as it is called, were shipped from South American ports. See W. H. Russell's *Visit to Chile and the Nitrate Fields of Tarapaca.*

Salts make up a very important class of substances in chemistry, of which common or

sea salt is the most familiar example. Epsom salts, saltpeter, and Rochelle salts are other well-known salts. Common salt was known from the earliest times, and the name salt was given to other substances from the more or less likeness of these to common salt in appearance, taste, solubility, etc., but many substances, which have entirely different physical properties, are now called salts by chemists, and it is not necessary, from a chemical standpoint, that a salt should be white, soluble in water, or that it should have a salty taste. By a salt is ordinarily meant a substance that may be got from an acid by replacing part or whole of the hydrogen of the acid by a metal, or a substance capable of playing the part of a metal, as ammonium. For example, when nitric acid and oxide of lead act upon each other, the acid loses its hydrogen, the place of which is taken by the lead, thus forming lead nitrate, while the hydrogen of the acid and the oxygen of the lead oxide combine to form water. In neutral or normal salts the hydrogen of an acid has been wholly replaced by a metal; in acid salts, only partially replaced; and in basic salts, more than replaced, there being more atoms of metal in the salt than there were atoms of hydrogen in the acid.

HORACE L. WELLS.

Salvador (*săl-vă-dôr'*), the smallest but most thickly populated of the Central American republics, is 140 miles long, and on an average 60 miles wide. It covers 7,225 square miles, and is about as large as New Jersey. The bulk of Salvador is a level plain, 2,000 feet high, cut by rivers and broken by many volcanic peaks from 4,900 to 6,900 feet high. Some of these volcanoes are still active, and one, Izalco, has been in a state of eruption for over a hundred years. On the northern frontier is a portion of the Central American cordillera. The chief rivers, all of which flow to the Pacific, are the Lempa, which receives the waters of the Laguna de Cuija, a large lake on the borders of Salvador and Guatemala, and the San Miguel. The well-watered and rich soil is divided into small farms, which will yield four crops of corn a year. The main products are coffee, indigo, and balsam; the balsam grows only on one part of the seaboard, called the balsam coast. Gold, silver, coal, and iron are found, but the metal yield of the country is not great. The bulk of trade is with the United States and Great Britain.

The whites number only 20,000, most of the people being Indians or of mixed race. The Indians are Aztecs, speak Spanish, and are Roman Catholics. A president, chosen for four years, a cabinet of four secretaries, and a congress elected once a year, carry on the government. Education is free and compulsory. The army numbers 4,000 men, besides 18,000 militia. A railroad connects the capital, San Salvador (population 50,000), and the chief port, Acajutla. Another road is planned to run from La Union, the best harbor, to San Miguel, and thence to San Salvador.

Salvador's first name was Cuscatlan. Pedro de Alvarado had great trouble in conquering it in 1525–26. The country freed itself from Spain in 1821, and two years later joined the Central American Confederacy. Since 1853, it has been an independent republic; it has been without foreign wars since 1864, with the exception of the short war with Guatamala in 1890. This war put an end to the proposed treaty of union between the five Central American states. Population 803,534. See Bates' *Central America.*

Salva'tion Army, a religious body which was founded in England in 1865 by the Rev. William Booth. The Salvationists' beliefs do not differ greatly from those of other Christians, but their methods are entirely new. Mr. Booth's idea was to reach the poorer classes of London by means of a military organization, and in this work he was ably seconded by his wife. The name Salvation Army was adopted in 1878, and its head was thereafter known as General Booth. Its growth has been wonderful, there now being 4,345 corps, with 12,050 officers, in thirty-five countries in every part of the world. A country is mapped out into districts, each under the care of a major. Every large town in a district is occupied by one or more corps under a captain, with lieutenants to assist him. Their work is to carry on daily services indoors and out of doors, to care for recruits, and to work in every way for the salvation of souls, and they are supported by the army. Services are held in the streets, with processions, accompanied by banners, drums, and tamborines. All are bound to abstain from liquor and to lead unselfish lives. One who can hardly read is as welcome as the cultured, and women as well as men are enlisted and can hold any position. The army is supported by offerings, gifts, and the profits of their press, of which the *War Cry* is the best-known paper. These papers have a circulation of 804,000 weekly copies and 131,000 monthly copies. Counting books, song books, etc., their publications have a circulation of nearly 4,000,000 a month.

In 1890, a scheme for uplifting the out-of-work and homeless multitudes, set forth in General Booth's book, *In Darkest England and the Way Out*, attracted wide attention, and funds were collected to enable him to carry out his plan. By this plan outcasts are first taken into a city colony, given shelter and food, and offered work of some kind. If found willing to work and do right, they are then sent to the farm colony, and afterward shipped to the "colony over the seas" as emigrants. In 1896, Ballington Booth, son of General Booth, who had for some years been in charge of the Salvation Army in the United States, separated from the parent society, and established a new organization,

named "The Volunteers." In character, aims, and methods, this organization is similar to the Salvation Army. See General Booth's book mentioned above, and also his *Aggressive Christianity*.

Salvini (*sal-vē'nē*), **Tommaso,** was born at Milan, Italy, Jan. 1, 1830, of a family of actors. The boy had a good training and became well known as a member of Ristori's company. In 1849, he fought in the Revolutionary war, after which he went back to the stage. He played tragic parts, especially "Œdipus," "Saul," and "Othello." He was popular and successful at Paris, Madrid, Brussels, in England, and in the United States, which he visited in 1874 and 1881. In 1884, Salvini left the stage and retired to his villa near Florence. He died in 1896.

ALEXANDER SALVINI, son of the above, followed his father's profession, and gained considerable reputation, appearing successfully in the United States in the *Three Guardsmen* and other plays.

Samarcand (*săm-ăr-kănd'*), a city of western Turkestan, 130 miles southeast of Bokhara. Under its old name, Maracanda, it was taken and destroyed by Alexander the Great. Since its capture in 712 A. D. by the Arabs, it has been a sacred Moslem city. Genghis Khan took it in 1219 and killed three-fourths of its half a million people. Timur the Great made it his capital in the 14th century, when it still had a population of 150,000. Also from Timur's time date its finest buildings, as the Ulug-bed college, the tombs of the conqueror and his wives, and the great stone which he used as a throne. Samarcand had a checkered history from the decay of Timur's empire, till in 1868 it was taken by the Russians from the emirs of Bokhara. A railroad now joins Samarcand to Merv and the Caspian sea. The many gardens are irrigated; manufactures of harness, pottery, etc., are carried on, as is also a brisk trade in silk, rice, horses, etc. A garrison of 6,000 Russians holds the citadel, which is built on a steep hill. Population 54,900.

Sama'ria, the capital of the northern kingdom of Israel, after the ten tribes became independent of Judah. It was founded by Omri. It was about five miles northwest of Shechem, and thus near the middle of Palestine. It stood on the top of a hill 1,450 feet high, and was easily made a place of considerable strength. The Syrians besieged it in vain, but about 721 B. C. it fell before the attacks of the Assyrian kings, Shalmaneser and Sargon. Nearly all the Hebrews of the capital and country were carried captives into Babylonia. Their places were taken by Assyrian colonists. These settlers, though still keeping a good deal of their heathen ways of worship, adopted for the greater part the religion of the Israelites; but the refusal of the Jews to accept their help in rebuilding the temple at Jerusalem caused bitter feeling; and in 409 B. C. the Samaritans built on Mt. Gerizim a rival temple. This enmity between the Samaritans and the Jews, became so great that the "Jews had no dealings with the Samaritans," and the Samaritans none with the Jews. Alexander the Great captured Samaria, and brought there a colony of Greeks. The Jewish captain, John Hyrcanus, after a year's siege, took Samaria, and razed it to the ground, about 110 B. C. But the Samaritans clung to the spot, and after a bloody siege by the Romans saw their city a second time destroyed. Samaria was, however, rebuilt, and held by Herod the Great. The place is now but a heap of ruins, and most of the Samaritans were, like the Jews, scattered to the four winds; yet as late as 529 the few left rose in rebellion against the Eastern Empire.

Samoa (*să-mō'ă*), is the name of a group of islands in the Pacific, from 400 to 500 miles northeast of Fiji. All but one are of volcanic formation, and are mostly surrounded by coral reefs. They are mountainous, well wooded, with rich soil. Only four are of any size. The largest, Savaii, is 47 miles long and 28 miles wide. Upolu has on its northern side the bay and harbor of Apia, while on the shore of the bay is Apia, the chief town of the islands. In the spring there are disastrous hurricanes. Copra, the dried kernel of the cocoanut, is the chief export. Cotton, coffee, and tobacco are grown, and sugar cane grows wild. Steamers ply between Apia and San Francisco, Auckland, and Sydney.

The Samoans belong to the brown Polynesian race. They are a well-formed people, but lessening in numbers, the present population being about 35,000. The Frenchman Bougainville visited the islands in 1768, and called them the Navigators' islands, from the skill of the native boatmen. The natives are now Christians. By treaty in 1889 the United States, Great Britain, and Germany assumed joint control of the islands.

This arrangement continued in force till 1898, when King Malietoa Laupepa died, and disturbances arose regarding the succession. A joint commission which was appointed recommended, among other measures, the abolition of the kingship. The result was that, by the Anglo-German agreement of Nov. 14, 1899, accepted and ratified by the United States in January, 1900, Great Britain renounced all rights over the islands in favor of Germany as regards Savaii and Upolu, and in favor of the United States as regards Tutuila and other islands. In February, 1900, a naval governor was appointed for Tutuila. The island of Tutuila, 70 miles from Apia, has an area of about 54 square miles, with a population of 3,800. Manua and the other islets have a united area of about 25 square miles, with about 2,000 inhabitants. Tutuila is mountainous, luxuriantly wooded, and fertile. It is described as

the most pleasing of the Samoan islands. The harbor at Pago-Pago, which penetrates the south coast, is the only good harbor in Samoa.

Sa'mos, an island in the Ægean sea near the Asia Minor coast. It covers 180 square miles. A chain of mountains runs through the island. Between it and the mainland runs the mile-wide channel Mycale, where in 479 B. C., the Persian fleet was routed by the Greeks. The main product is wine, though olive oil, raisins, hides, etc., are also exported. Tanning is an important business. The capital is Vathy. The old city of Samos is now called Tigani. It was celebrated for its aqueduct, cut almost a mile through the heart of a mountain; a huge mole built to protect the harbor, and its temple to Hera. In early times famous red pottery was made in Samos. The Samians, like the Corinthians, were among the earliest and most daring sailors; a Samian is said to have first passed the Pillars of Hercules into the Atlantic; and Samos was the mother of colonies in Thrace, Cilicia, Crete, Italy, and Sicily. The island was mistress of the Ægean isles under its greatest ruler Polycrates (532–522 B. C.). No Greeks were more patriotic than the Samians in the war of independence in 1821, but were forced, though the rest of Greece became free, to remain in the hands of their masters, the Turks. The island is, however, governed by a Greek who is called prince of Samos. See Tozer's *Islands of the Ægean.*

Samo-Thrace is an island in the northeast corner of the Ægean sea. Mt. Saoce, 5,248 feet high, takes up nearly its whole surface, sixty-eight square miles. From this peak Poseidon watched the combats on the plain of Troy. Samo-Thrace was for many years a sacred spot, where were worshiped the strange gods known as the Cabeiri. In 1457, and again in 1821, the Turks killed nearly all its people. Population about 2,000. See Tozer's *Islands of the Ægean.*

Samp'son, William T., rear-admiral United States navy, was born at Palmyra, N. Y., in 1840. He graduated at Annapolis, first in his class, in 1861. He was on the *Patapsco* when she was destroyed by a torpedo in Charleston harbor, 1865. He was made lieutenant-commander in 1866 and commander in 1874. He served six years as instructor at Annapolis and commanded successively the *Swatara, Iowa,* and *San Francisco.* On the outbreak of the war with Spain he was appointed acting rear-admiral, March 26, 1898, and placed in command of the North Atlantic squadron operating against Spain in Cuban waters. When the Spanish fleet under Cervera took refuge in the harbor of Santiago de Cuba, Sampson established a close blockade of that port, resulting in the destruction of the Spanish fleet when it attempted to escape from the harbor, July 3, 1898. At the close of the war he was made Rear-Admiral. Died May 6, 1902.

WILLIAM T. SAMPSON.

Sam'son "judged Israel twenty years." He was a Danite, and a native of Zorah. At his birth he became a Nazarite, and in accordance with this vow his head remained unshorn and his lips never knew the taste of wine. The account of his marvelous feats of strength and his fall through his love for Delilah, a Philistine woman, forms one of the most interesting of Bible stories.

Sam'uel, the last of the judges, the first of the prophets, and next to Moses the greatest man in the early history of Israel as a nation. He was an Ephraimite; and set apart by his mother for the priesthood, he became a temple attendant under Eli, the high priest, at Shiloh. While but a child he foretold the downfall of Eli and his house. Twenty years after his master's death he gathered the people at Mizpah, routed the Philistines, and governed the nation for twenty years. On the people's wishing for a king Samuel reluctantly anointed Saul and afterward David, as kings of Israel.

San Anto'nio, the first city of Texas, is on the San Antonio river. It has a large trade in horses, mules, wool, hides, and grain, and has flour mills, breweries, tanneries, etc. There is a Roman Catholic cathedral and seminary, a United States government building, courthouse, and large park. Its broad plazas are overarched by fine old trees. In the Mexican quarters of Laredito and Chihuahua may be seen Spanish manners and customs, markets, shops, cafés, and churches. In San Antonio, as elsewhere in Texas, many Germans have settled, and have greatly helped to build up the city. Except during the war, San Antonio has been the state headquarters of the United States army since 1848, and the quartermaster's depot covers eight acres, while the arsenal covers twenty acres. Fort Alamo, just across the river, was the scene of the massacre by Santa Anna of the garrison of 188 men, including Crockett and Bowie, in 1836. The place was founded by the Spaniards in 1714, who built here a fort, and four years later some monks began the mission of the Alamo. Population 53,321.

San Diego (*dē-ā'go*), the main port of southern California, stands on the beautiful bay of the same name, 125 miles southeast of Los Angeles. The bay, six miles long, forms a good and very busy harbor. The climate is remarkably genial and thousands of tourists come here, and to Coronado Beach, a suburb across the bay, whose hotel cost $1,200,000. San Diego is the oldest city in California, and the ruins of Father Junipero's Jesuit

mission of 1768 are still preserved. A few miles back, at the mouth of a cañon, stands the famous Sweetwater dam, one of the largest in the world, with a curving wall of masonry 90 feet high and 46 feet through at the base. A large trade in wool and other products of the country is carried on. A monument to Richard A. Proctor was set up near San Diego in 1891. Population 17,700.

San (or **Santo**) **Domin'go,** capital of the Dominican Republic, is on the south coast of the island of Haiti. It was founded by Columbus as early as 1494. The main buildings are the Gothic cathedral, where the ashes of Columbus found a rest from 1536 to 1796, the hospital, arsenal, and government buildings. A wall surrounds the town, and forts and batteries defend the harbor. Population 15,000. The republic of the same name, which embraces the eastern portion of the island of Haiti, has an area of 18,045 square miles, with a population of 610,000.

San Francis'co, the chief city of California and the Pacific coast, stands on a peninsula between the sea and the bay of San Francisco. The bay stretches north and south of the city for 47 miles, with a width of six to ten miles. Joining San Francisco bay on the north are San Pablo bay, 10 miles long, in which is Mare island and the United States navy yard,

and Suisun bay, eight miles long, into which fall the San Joaquin and Sacramento rivers. The entrance to San Francisco bay is the famous Golden Gate, a strait a mile wide and five miles long. The shores of the strait are rocky cliffs, in some places nearly 2,000 feet high. The bay is a large factor in making San Francisco's site of such business importance. Near the city are three islands; Goat island, or Yerba Buena, Alcatraz, and Angel island, the two last of which are fortified.

Two hills within the city rise several hundred feet high. San Francisco has many large and fine buildings of marble, granite, terra cotta, iron and brick, yet in spite of many bad fires, it is still, because of its climate, largely a wooden city. Among the public buildings are the sub-treasury, mint, stock exchange, city hall, theatres, etc. The Palace hotel, cost over $3,000,000. Like Central Park, New York, the beautiful Golden Gate park has been reclaimed from a waste tract, in this case of sand dunes. The park runs along the seashore for about three miles and covers 1,050 acres. At Point Lobos are the Cliff House, Seal Rocks, and Sutro Heights, which are popular resorts in the summer, and there are a dozen or more public squares within the city. Among the notable church edifices are St. Mary's cathedral, St. Ignatius church and college (Roman Catholic), the Unitarian church and Grace church (Episcopalian). The public schools are maintained at an annual cost of $1,274,696. The teaching force numbers 1,015, and the number of pupils in attendance is 48,058. At San Francisco are the schools of dentistry, pharmacy, law, and medicine of the University of California. Other schools of the city are Cooper Medical college, Hahnemann Medical college, the School of Mechanic Arts founded by James Lick, the California Academy of Sciences, also endowed by Mr. Lick, and the Cogswell Polytechnic college. The free public library has 75,000 volumes; other libraries are the Mercantile, Mechanics', Odd Fellows', and law libraries.

Cable roads were first used in San Francisco and were invented as the easiest method of transit over its steep and hilly streets; there are now numerous lines of electric railway. Electric lighting and gas are used; and water is furnished by a private company, which brings the 30,000,000 gallons used daily from creeks and reservoirs twenty miles distant. San Francisco has almost the only good harbor on the Pacific from Mexico to Puget sound. Steamers ply to Hawaii, the Philippines, Alaska, Australia, China, Japan, Central and South America; there is a large coast trade as far north as Sitka, and whaling fleets start from this port for the Arctic. San Francisco is an important wheat port, exporting yearly nearly 1,000,000 tons; and the yearly imports and exports amount to $150,000,000. Some 20,000 workmen are employed in the city's mills and factories. Among the leading lines are iron, glass, woolens, and blankets, cable and wire, flour, mining machinery, cordage, and sugar.

As much or more than any American city do the people of San Francisco represent the entire globe. Newspapers in half a dozen languages are here published; 25,000 Chinese live in their quarter, while Mexicans, Maltese, and Greeks elbow the Europeans more common to others of our cities. Population 342,782.

The mission of San Francisco de Asis, often called the Mission Dolores, was founded

in 1776 by Spanish Franciscan monks. This mission became wealthy and in 1825 controlled 1,800 Indians. A few years after it was turned over to the civil officers, in 1834, nothing was left of it but the adobe buildings. In its place grew up the village of Yerba Buena, the first house of which was built in 1835. The town was taken by an American man-of-war in 1846, and the next year its name was changed to San Francisco. The discovery of gold in 1848 made it a city at one leap. In the spring of 1849 its population was 2,000, at the end of that year it was 20,000. Five great fires in 1849–51, which swept away the wooden houses thickly crowded together, did not stop the growth in the slightest. In 1851 and 1856, because of bad city government, the people organized a vigilance committee and hanged a number of criminals.

San Jacin'to, Battle of, the last battle of the Texan war of independence, took place April 21, 1836, near the town of San Jacinto, Tex. General Santa Anna, in command of the Mexican force of 2,000, was attempting to cut off the retreat of the Texans, and came up with them at the mouth of the river. Gen. Sam Houston ordered his small force of 783 men to charge, which they did to the shout of "Remember the Alamo!" (See ALAMO.) After fighting an hour and losing 630 men, the Mexicans surrendered. This decisive battle ended the war.

San Jose (*hō-sā'*), **Cal.,** is on the Gaudalupe river, 50 miles southeast of San Francisco. Besides a fine courthouse and a city hall, it contains the state normal school and a Roman Catholic college for girls. Near by is the famous Lick observatory. There are three parks, and the city is noted for its gardens and fruit. It is a center for fruit canning and wine manufacture, besides which there are flour, woolen, and other mills. Population 21,500.

San Jo'se, the capital since 1823 of Costa Rica, stands in a rich plain, 3,711 feet above the sea. There are many squares and two large parks. The notable buildings are the presidential and national palaces, and that of justice, the cathedral, and the bishop's palace, the old university buildings, two colleges, and the covered market. The chief factory is the government distillery. A railroad joins the capital to Limon, the Atlantic port. Population 25,000.

San Luis Potosi (*lō-ēs' pō-tō-sē'*), capital of the Mexican state of the same name, stands on the edge of a table-land, 7,400 feet above the sea, 362 miles northwest of Mexico City. It is well built, and contains a fine cathedral, a seminary, railroad workshops, a cotton factory, and very large smelting works. There are silver mines near by. The city was founded in 1586, and in 1863 was the seat of Juarez's government. Population 69,050.

San Marino (*mä-rē'nō*), the smallest independent state in Europe, and a republic, lies among the Apennines. It covers but 33 square miles, and contains some villages besides the town of San Marino. The town, which is built on a mountain crag, can be reached by only one road. Farming and cattle breeding are the main occupations. Its independence was recognized by the pope in 1631, when the duchy of Urbino, a part of which it had been since the 13th century, was annexed to the papal states. It is governed by a grand council, the members of which are chosen for life, one-third of whom are nobles. There are two captains-general chosen, who each hold office for six months. Population 9,500.

San Salvador (*säl'vä-dōr'*), the capital of the republic of Salvador, is built at the foot of the extinct volcano of San Salvador (8,360 feet). The houses are mostly of one story, with thick walls, on account of earthquakes. The government buildings are handsome, and a fine cathedral is not yet finished. The city was founded in 1528. In 1854 it was a fine, well-built city, with a population of over 25,000, but on the night of April 16, it was wholly destroyed by an earthquake. Violent shocks of earthquake have been felt in 1873, 1879, and 1891. Population to-day, 50,000.

Sand, a term loosely applied to incoherent mineral matter occurring in particles smaller than pebbles, and larger than particles of mud or dust. If the mineral matter is fine enough to become mud when wet, it would hardly be called sand. Between clay, the particles of which are very small, and sand, there is no sharp line of demarcation. The one grades into the other. The same is true of sand and gravel. Sand is usually made up chiefly of quartz, but it generally contains other mineral matter in small quantities, and sometimes it is largely made up of other minerals. Grains of sand are usually thought to be round, though this is rarely the case. They are, however, often roundish. As it occurs in nature, quartz sand is made up of partly rounded bits of quartz crystals. These crystals originally occurred in igneous rock, and by the decay of the other minerals of the rock, the quartz crystals were set free. They were then brought together in valleys and along shores by the wash of rain, streams, and waves. The purest varieties of quartz sand are used for the manufacture of glass. Sand is extensively used with lime for mortar, cements, etc. When cemented by natural processes, sand becomes sandstone.

Sand Dollar, the name given to a flattened sea urchin, very common on sandy shores. The soft parts are inclosed in a rounded, flattened disc, made of plates of carbonate of lime nicely fitted together. When living the discs are covered with short spines. They are dark yellow or whitish if bleached in the

sun. There are five rows of plates with minute holes, for the tube feet as in other sea urchins, and five rows without holes. In certain forms, the disc is completely perforated by a number of orifices of a key-hole pattern. See SEA URCHIN.

SAND DOLLAR.

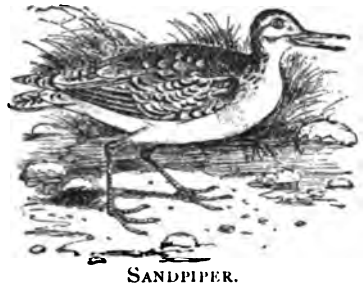
Sand, George, the assumed name of Armandine Lucile Aurore Dupin, was born at Paris, July 5, 1804. She was educated at a convent in Paris, and at eighteen married M. Dudevant. After nine years of married life she separated from her husband and went to Paris to make her living by writing. Her life was spent among authors and literary people generally, her most intimate friends being Alfred de Musset, Chopin, Lamennais, and Michel. After twenty years of this life she settled on her estate of Nohant in Berri, dividing her time between writing, at which she was very industrious, and showing hospitality to almost all French and many foreign men of letters of eminence. George Sand wrote an enormous number of novels. Among the best are *Consuelo*, *Mauprat*, *The Little Fadette*, and *The Marquis of Villemer*. Her plays did not gain the extraordinary popularity of her novels. Her *History of My Life* is interesting, but is mostly made up of her fancies and thoughts. George Sand died June 7, 1876. See *Life*, by Miss Bertha Thomas.

San'dalwood, the wood of *Santalum album*, a small genus of trees and shrubs from the East Indies, Australia, and the Pacific islands. The wood of *S. album* is white or yellowish and sweet scented when dry.

Sand'blast. See GLASS.

San'derling, a bird of the snipe family, which is widely scattered, breeding in Arctic regions and ranging from Iceland to Patagonia. It is about eight inches long and very fat. The winter plumage is ash gray; the under parts are all white, and in summer the upper feathers are reddish with black markings.

Sand'piper, a name commonly applied to several shore-birds belonging to the snipe family. These birds run over the sand uttering a piping note, which doubtless gave them their name. They are small active birds, running along the shore and feeding on the small forms of life cast up by the waves. Many of them are simply migrants in most parts of the United States. The best-known form nesting in the United States is the spotted sandpiper. This is a true snipe, about seven and one-half inches long, with upper parts brownish, gray, and black, the under parts white, spotted with



SANDPIPER.

black. It is also called Tip-up and Pee-wit. The semi-palmated sandpiper, or sand-peep, is about an inch shorter than the form just described. It is similar in coloring, but has no spots on the breast. They are abundant during migrations in flocks, which sometimes number several hundred. See SNIPE.

Sand'stone is a rock formed of compacted sand. The grains are generally quartz, though other minerals are often mixed with this; they are colorless, or of a dull white, yellow, brown, red, or green. The grains vary in size, forming a fine or coarse grained stone. Sandstones, especially when of handsome colors, are much used in building.

Sandus'ky, O., stands on the south shore of Sandusky bay, an arm of Lake Erie, 56 miles (by water) west of Cleveland. The bay, 15 miles long and five wide, forms a good harbor. The city is built on a bed of limestone, on a site rising gradually from the shore. Its business as a lake port is large, its wharves shipping quantities of fish, lime, limestone, lumber, salt, coal, ice, wool, wheat, flour, and Ohio wine. There are also machine and car works, and edge tool, wheel, and woodwork factories. Sandusky is an important import and export point for Canadian trade. The neighboring islands are a favorite summer resort. Population 19,664.

Sand'wich Islands. See HAWAIIAN ISLANDS.

San'dy Hook, a narrow sandy peninsula of New Jersey, between the Atlantic and Sandy Hook bay, 16 miles south of New York. It is about six miles long, and reaches northward toward the Lower Bay of New York. Near the north point are a fort, a life-saving station, and Sandy Hook lighthouse, with a lantern 90 feet high. The voyage across the Atlantic is considered to begin at Sandy Hook.

Sangir (*säng-gēr'*) **Islands,** a group of fifty mountainous and volcanic islands between the Philippines and Celebes, covering 323 square miles. The largest, Great Sangir, on which a fourth of the people live, contains

the volcano Abu, the eruption of which in 1856 cost more than 6,000 lives. The people, who number 50,000, are Malays, and are ruled by their own chiefs under the protection of the Dutch.

San'hedrim, the supreme national council of the Jews, established under the Maccabees. There were seventy-one members, and it was presided over by the Nasi ("prince") at whose side stood the Ab-Beth-Din ("father of the council"). The members were priests; elders, by which was meant heads of families; scribes, or doctors of the law, and men of learning. The high priest, if a man of learning, otherwise "he who excels all others in wisdom," was appointed president. This court had power over life and death, regulated admission into the priesthood, and slowly gathered to itself the whole internal government of Palestine. It usually met daily in a hall in one of the temple courts, though on extraordinary occasions it met at the house of the high priest. After the destruction of Jerusalem, the Sanhedrim found its way to Babylon. See Schürer's *History of the Jewish People in the Time of Christ.*

San'itary Commis'sion, The, was established by women of the northern states at the beginning of the Civil war, to aid and comfort the soldiers of the Union. Its inspectors endeavored to improve the ventilation, drainage, clothing, cookery, etc., in the several camps. To it was due the establishment of pavilion hospitals at the camps, and of soldiers' homes at recruiting points; it provided hospital steamers and cars for sick soldiers, and distributed the supplies given the soldiers by the women of the land. The commission was a board of twenty-five men; its president was Dr. Henry Bellows, of New York. During the war $4,924,481 were received, besides supplies worth $15,000,000.

Sansculotte (*sanz'ku-lŏt'*), that is, "without breeches," was the name given in scorn at the beginning of the French Revolution by the court party to the democratic party in Paris. The latter adopted the name with pride, and used it as a title to distinguish the "good patriot." The name was given because of the revolutionists giving up knee breeches and wearing trousers, not because of their roughness of manner or raggedness of dress, as has often been supposed.

San'ta An'na, Antonio Lopez de, president of Mexico, was born at Jalapa, Feb. 21, 1795. When fifteen he entered the Spanish army, and served against his countrymen till 1821 when he joined Iturbide, who made him brigadier-general and governor of Vera Cruz. In 1822, Santa Anna proclaimed a republic and brought about the downfall of the emperor Iturbide. In 1829, he defeated and captured a body of Spanish troops which had landed at Tampico, and in 1832 through intrigue and revolt had himself chosen president. Under Santa Anna the states became mere provinces, while all power was in the hands of the central government. This policy cost the country Texas in 1836. Santa Anna invaded this province with 6,000 men, and defeated and massacred the Texans with unbroken success, till he was routed and his army and himself taken prisoners, by Gen. Sam Houston, at the battle of San Jacinto. After eight months' imprisonment he was set free, but his influence at home was not recovered till his gallant defense of Vera Cruz against an attack of the French in 1838. In 1841, a revolution again put him in the president's chair, and in 1845 another revolution sent him into exile at Havana. But in 1846 the war with the United States, which had opened badly with the loss of Palo Alto, Resaca, and Monterey, caused the Mexicans to recall Santa Anna, and to make him president and commander-in-chief. But the loss of the battle of Buena Vista to Taylor, and that of Cerro Gordo to Scott, followed by the certainty of the fall of the capital, induced Santa Anna to leave the city by night, after resigning the presidency. In 1853, he was made president for life, but his harsh rule caused him to be driven from the country two years later. In 1867, after the death of Maximilian, he tried to land in Mexico, was captured, tried, and condemned to death, but was pardoned on condition of his leaving the country. He died at Mexico City, June 20, 1876.

San'ta Claus, a corruption of the name St. Nicholas. The term was first used by the Dutch settlers of New York, who kept a San Claus holiday. Santa Claus is held to be the patron saint of the young, and his feast held on Dec. 6 was celebrated formerly in England, and still is in Germany. Now the visits of Santa Claus bearing gifts to the children is transferred to Christmas.

Santa Fe (*săn'ta-fā'*), the capital of New Mexico, is built among the Rocky mountains, 6,840 feet above the sea, and is 1,327 miles southwest of Chicago. The site is a mountain-walled basin, 20 miles from the Rio Grande. One half of the people are Mexicans, dwelling in low adobe houses, on narrow little streets. The Plaza has shops on three sides, and on the other the old governor's palace, a long, low adobe building. The climate is very dry, so that irrigation is necessary for gardening or farming. When first seen by the Spaniards about 1542, the town was a well-peopled Indian pueblo. It has been the capital since 1640. The Indians captured it, burned the main buildings, and drove out the whites in 1680. The Indians again made an attack in 1837, but were driven off by the Mexican governor, Manuel Armijo. General Kearny occupied it with United States troops in 1846. During the Civil war the Confederates held Santa Fé for a few weeks in the spring of 1862. Population 5,603.

Santiago (*sän-tē-ä'gō*), the capital of Chile, stands on a wide and beautiful plain near the western base of the Andes, 1,700 feet above the sea level, and 115 miles southeast of Valparaiso. The town is well built, but most of the houses are only one story high, owing to earthquakes. The chief square is the Plaza Independencia, its sides formed by the government palaces, arcades, the cathedral, and archbishop's palace, and a handsome hotel. On the site of the Jesuit church, which was burned down in 1853, is a marble and bronze monument in memory of the 2,000 worshipers, mostly women, who perished in the fire. The government buildings include the capitol, mint, president's dwelling, prison, two hospitals, and a deaf and dumb asylum. The Alameda, with four rows of fine poplars, runs the whole length of the city and is adorned with many statues. Facing it are the university with 912 and the national institute with 1,148 students. There are other special schools, besides a national library of 65,000 volumes, botanical and zoological gardens, exposition buildings, theatres, and clubhouses. Santiago is surrounded by pretty suburbs dotted with villas and gardens bright with flowers. There is considerable trade, and a busy stock exchange. Cloth, ships' biscuits, beer, ice, etc., are manufactured. Santiago was founded by Pedro de Valdivia in 1541. Population 256,412.

Santiago de Cuba (*sän-tē-ä'gō dā kö'bä*), a southeastern province of Cuba, area 10,125 square miles (population 327,715); also a fortified city, seaport, and former capital of the island, situated near the mouth of the river Santiago, fronting a harbor four miles long on the southern coast. The island, after having been continuously in the possession of Spain from its discovery, was as the result of the Spanish-American war of 1898, relinquished by that Power; while the United States government (which had captured Santiago and the southeastern part of the island by its troops, and by its fleet destroyed that of Spain, on its attempting to escape seaward from the harbor of Santiago de Cuba) undertook the obligations with respect to the protection of life and property which naturally resulted from its occupation of the island, so long as that occupation should last. The American administration of the city and province was in July, 1898, intrusted to Maj.-Gen. Leonard Wood, and was by him ably conducted. He effected many reforms in this region and did much to improve the sanitary condition of Santiago and secure its good and orderly government. He also established public schools, instituted courts of law, and constructed roads inland and along the coast. The region is known to be rich in metals, including iron, copper, and manganese: it is also rich in forests of cabinet woods, such as mahogany and cedar, besides dye woods and other elements of wealth. Its chief products are, however, sugar and tobacco; while in the city there are many cigar factories, foundries, and saw-mills.

On the outbreak of the war in Cuba, the Spanish fleet under Admiral Cervera was in West Indian waters; on May 20, 1898, this squadron entered the harbor of Santiago and was at once blockaded by a United States fleet, commanded by Admiral Sampson. To "bottle up" the Spanish vessels in the harbor, a gallant feat was attempted by Naval-Constructor, Lieut. R. P. Hobson, which was to take the United States ship *Merrimac* into the narrow channel between the Morro forts, at the exit of the harbor, and there sink her with torpedoes. This gallant deed was effected on the night of June 3, and was rendered all the more hazardous, not only by the blowing up of the ship, but by the fire drawn upon her from the enemy. Hobson and his volunteer crew were all made prisoners, two only of their number having been wounded. A few days after this, a force of United States marines made a landing at Caimanera and formed Camp McCalla; while General Shafter landed a division at Baiquiri and General Wheeler landed another at Siboney, the landing of the troops being covered by the guns of the United States fleet. These forces, proceeding toward Santiago, were met near Sevilla, six miles inland from Baiquiri, by a Spanish force, when the battle of Las Guasimas was fought. Following upon this (July 1st), occurred the two bloody engagements at San Juan and El Caney, in which the Spanish forces were defeated and driven within the fortifications of Santiago. Then came the fatal dash of Cervera's squadron out of the harbor of Santiago and its speedy annihilation by the United States fleet, July 3,—a splendid naval achievement. Operations against the city were now pressed by General Shafter, resulting in the surrender, July 14, of the city and province of Santiago de Cuba, together with over 20,000 Spanish troops under General Toral. Population of the town, 43,090.

Sao Francisco (*sän frän-sēs'ko*), a large river of Brazil, rises in the southwest part of the province of Minas Geraes, in its lower course separates the provinces of Bahia and Sergipe from Pernambuco and Alagoas, and after a course of 1,800 miles falls into the Atlantic. It is navigable as far as the mouth of the Paraopeba, except at three points, one of which is the falls of Paulo Affonso (275 feet), around which traffic is carried by rail.

Sao Paulo (*sän pou'lō*), capital of the Brazilian state of the same name, stands on a wide plain, four miles from the Rio Tiete and 310 southwest of Rio de Janeiro. There is a handsome public garden, and there are beautiful suburbs. The main buildings are the government palace, formerly a Jesuit college, the bishop's palace, and a celebrated law school. Sao Paulo is the headquarters of the

coffee trade, and four railroads join it to the coffee districts. There are a number of factories. Population 64,934, including 12,000 Italians and 1,500 Germans.

Sap, Ascent of. See WATER, ASCENT OF.

Sapphire (*saf'ir*), the most precious of gems except the diamond and ruby is, like the latter, a variety of corundum. The name sapphire is commonly given to the beautiful blue variety of corundum, but stones of other shades, such as colorless or pink, sometimes receive the name. Purplish or greenish colors are undesirable, while clouds, milky spots, flakes, or stripes show flaws. It is found crystalized, usually in si sided prisms, ending in six-sided pyramids. It is sometimes found imbedded in gneiss, but more often in clay soils. The finest sapphires are found in Ceylon; Cashmere and Burma also produce beautiful specimens; and sapphires are found in the United States, particularly in Montana, Victoria, and New South Wales. The value depends on quality rather than size and does not increase with the size as does that of the ruby. A sapphire of 165 carats was sold in 1867 for $40,000. In early times a dark-hued or indigo sapphire was called a "male sapphire," a pale blue, a "female sapphire."

Sappho (*saf'ō*), one of the great poetesses of the world, was born on the island of Lesbos in Greece. She was only six years old when she lost her father, and she must have lived about the end of the 7th century B. C., as she flourished at the same time as the poets Alcæus and Stesichorus. But little is known of her life except that she had a daughter named Cleis, and was acquainted with Alcæus. It is said that she fled from Mitylene to Sicily for refuge about 596, but a few years later came back to Mitylene, where she was the center of a group of girls with a passion for poetry. But two of her odes, one to Aphrodite, with a number of short fragments have survived the wear and tear of centuries, but they are enough to assure her genius. For sincerity, deep feeling, passion, and exquisite grace, her lyrics stand alone. There is a story that she fell in love with a beautiful youth, and because he did not return her love, she plunged from a precipice, called the Leucadian rock, into the sea.

Saprophytes (*saf'ro-fits*), plants which are not able to make their own food, and which do not attack living plants or animals, but obtain their food supply from decaying bodies or organic products. These plants are not able to make their own food because they do not contain chlorophyll. They attack dead bodies or body products and sooner or later all organic matter is attacked and decomposed by them. Were it not for them it is said that "the whole surface of the earth would be covered with a thick deposit of the animal and plant remains of the past thousands of years." Saprophytes are mostly fungi, but some of the higher plants also adopt this method of obtaining food. See FUNGI.

Sap Suck'er, a name loosely applied to several small black and white woodpeckers, and also to the white-bellied nuthatch. The only true sap sucker is the yellow-bellied woodpecker, a permanent resident in some parts of the United States, and a winter resident in other parts. The bird is about eight and one-quarter inches long, black and white above, with dusky sides, black on the breast, and the belly yellowish. The crown is reddish in the adult. These birds perforate the bark to the sapwood and devour the same. They have done extensive damages to orchards and shade trees in the west.

Sap'wood. As the trunks of trees increase in diameter each year new layers of wood are laid down. The ascending sap moves through the newer wood, gradually abandoning the older. This newer wood, therefore, is known as "sapwood," in distinction from the abandoned wood, known as the "heart-wood," which see.

Saracens (*sar'a-sens*), the name formerly given by western writers to the Mohammedans of Syria and Palestine, the Arabs generally, or the Arab-Berber races of North Africa, who conquered Spain and Sicily, and invaded France. Later it was used to mean all nations against which crusades were preached, and was thus applied to the Seljuks of Iconium, the Turks, the Gypsies, and even the pagan Prussians. Whether the word comes from Sarah, the wife of Abraham, from an Arab word meaning "to steal," from another meaning "desert," from a Hebrew word meaning "poor," or from an Arab word meaning "eastern people," has been disputed, but the last guess is the most likely. See ARABIA, CRUSADES, MOORS.

Saragossa (*să-ra-gŏs'ă*), a city of Spain, formerly capital of the kingdom of Aragon, stands on the Ebro, 212 miles northeast of Madrid. A seven-arched bridge, built in 1437, crosses the Ebro within the city. The low, brick houses and narrow, winding streets contrast strangely with the many tall and slender towers and spires. There are two cathedrals, one a Gothic building of the 13th century. The citadel Aljaferia was once the palace of the kings of Aragon, and later the headquarters of the Inquisition. The university, founded in 1474, has 800 students and a library of 18,000 volumes. The leaning tower, Torre Nueva, built in 1504, has been declared unsafe and ordered taken down. Cloth, silk, and leather are among the town's manufactures. The name Saragossa is a corruption of Cæsarea Augusta, by which name it was called in 25 B. C. It was an important Roman town, and it was one of the first Spanish cities to accept Christianity. Saragossa was taken by the Goths in

the 5th and by the Moors in the 8th century, and recaptured in 1118 by Alphonso of Aragon, after a five years' siege, during which most of the people died of hunger. In was twice besieged by the French in 1808, 60,000 people perishing in its defense. It was at this siege that the famous "Maid of Saragossa," whose exploit has been sung by Byron and Southey, fought by the side of her artilleryman lover. Population 98,188.

Saratoff (*să-ră'tŏf*), a city of Russia on the Volga, 500 miles southeast of Moscow, stands on terraces rising from the river. There are nearly 30 churches, two cathedrals, and a museum containing a fine art gallery and library. Brandy, liquors, oil, flour, and tobacco are manufactured. There is also a large trade. Saratoff was pillaged in 1774 by the Cossack pretender to the czardom, Pugatcheff. Population 137,109.

Saratoga (*sar-a-tō'gă*) **Springs, N. Y.,** one of the chief watering places in the United States, is in New York state, 38 miles north of Albany. It has twenty or more mineral springs, whose waters are bottled and exported. There are a large number of huge hotels, some having rooms for over 1,000 guests. There is a race track, and regattas are held on Saratoga lake, four miles away. Population 12,409.

Sarato'ga, Battle of, was fought Oct. 7, 1777, near Saratoga Springs, N. Y. The British under Burgoyne and the Americans under Gates had faced each other since Sept. 14. Burgoyne advanced against the Americans, who charged in turn, headed by Arnold, who had rushed without orders to head off the attacking column, and had assumed command. After a stubborn fight the British abandoned their guns, and retreated to their camp, followed by the Continentals, who charged and carried a part of the camp, when darkness put an end to the battle. On the 9th, Burgoyne retreated to Saratoga, where he was hemmed in by Gates, and forced to surrender on the 17th. At the time of the surrender, the American force numbered 10,817; the British surrendered 5,804 men, 4,647 muskets, and 42 guns. This victory was in some respects the most decisive of the whole war. Twelve miles to the east of Saratoga Springs, a handsome obelisk, 155 feet high, on a bluff 350 feet above the Hudson, overlooks the scene of this surrender, which it commemorates.

Sardanapalus (*sar-da-na-pā'lus*), according to Greek tradition, a king of Assyria, whose reign was ended by a revolt. The rebels were defeated several times, but at last shut up Sardanapalus in his capital, Nineveh, and besieged him for two years. When the city could hold out no longer, the monarch gathered all his vast treasures, and, setting them on fire, leaped with his wives into the flames. It is not certain what, if any, real king of Assyria is referred to under the Greek name, Sardanapalus. He was, perhaps, Asurbanipal, who began his reign in 668 B. C.

Sar'dine, a small fish of the herring family. It received its name from being taken abundantly off the coast of Sardinia. The true sardine is a tunny. They are abundant in the Mediterranean, and off the coasts of Spain and Portugal. They are salted, boiled in oil and packed in flat tin boxes containing oil. In this form they are exported as a delicacy to all countries. The supply of true sardines is now considerably reduced and is not sufficient to supply the market. As a result, sprats, pilchards, and other small herring have been preserved in oil, and sold under the name of sardines.

Sardinia (*sär-din'i-ă*), an island of Italy, after Sicily the largest in the Mediterranean, is 135 miles west of the mouth of the Tiber and just south of Corsica, from which it is separated by the strait of Bonifacio, seven and one-half miles wide. In the south is the gulf of Cagliari, a deep, wide bay, and in the north the gulf of Porto Torres. The island is 170 miles long, 75 miles wide, and covers 9,294 square miles. The country is generally mountainous, the highest peak being Gennargentu (6,233 feet). The grotto of Neptune on the west coast is one of the finest in Europe. Sardinia was in early times the granary of Rome, and was renowned for its mines. It has a rich soil, valuable mines, large forests and important fisheries, but these resources are only partially used. The main produce is wheat, barley, beans, potatoes, wine, olive-oil, oranges, lemons, tobacco, and flax. Large numbers of horses, cattle, sheep, swine, and goats are bred. Lead and zinc are the chief metals mined; granite, marble, and clay for pottery are quarried; and convicts manufacture salt from sea-water. The fisheries yield tunny, sardines, anchovy, and coral. There are a number of good ports — Cagliari (the capital), Porto Torres, Terranova, Tortoli, and others. The people are mostly of mixed races, Spanish and Italian. Italian is spoken by the educated, but the common language is a mixture of Latin, Italian, and Spanish. Eighty-three per cent. of the population cannot read or write; there are universities at Cagliari and Sassari. The practice of the vendetta and brigandage, once common, is now almost wholly stopped.

The first people of Sardinia seem to have been Iberians. These were conquered by the Phœnicians, but little is known of them before the conquest by the Carthaginians in 512 B. C., who ruled tyrannically till displaced by the Romans in the 3d century B. C. After the fall of the Roman empire, Sardinia was overrun by Vandal, Goth, Saracen, Byzantine, and Papal soldiers. After a twenty years' struggle the Pisans and Genoese drove out the Saracens and in 1299 divided the island between them. Its later masters were

the Aragonese, Spaniards, Austrians, and in 1720 it was exchanged for Sicily, and with Savoy and Piedmont became the kingdom of Sardinia, under the rule of the house of Savoy. Except for the short time it was annexed to France, under Napoleon, this family continued in power. After the French Revolution, Sardinia became of great importance among the smaller European states and took part in the Crimean war. Victor Emmanuel II. became king of United Italy and its later history is Italian. Population 775,986. See C. Edwardes' *Sardinia and the Sardes.*

Sar'dis, the capital of ancient Lydia, in Asia Minor, stood at the foot of Mount Tmolus (5,906 feet). Its people were rich. They wove luxurious woolen stuffs and carpets and carried on a large trade between the highlands and the coast. It was, moreover, the capital of the fabulously wealthy Crœsus. Its wealth was tempting; it was destroyed by the Cimmerian Gauls in the 7th century B. C., by the Athenians in the 6th, by Antiochus the Great in 215 B. C., and by Timur in 1402; besides this it was overwhelmed by an earthquake in the reign of Tiberius. Both Xerxes and Cyrus the Great lived here before setting out on their famous expeditions. Sardis lost its trade as Byzantium grew, and now only a small village, called Sart, stands on the ancient site.

Sardonyx (*sär'do-niks*), a variety of onyx, or stratified chalcedony, exhibiting white layers alternating with those of a red or brown color. It has always been a favorite stone with the cameo engraver, and hence the stone has been imitated artificially by spurious fabrications. The sardonyx, usually, is composed of two strata, viz., a thin layer of white chalcedony resting upon a ground of either carnelian or sard; though more rarely it presents three layers — a superficial stratum of red, an intermediate band of white, and a base of dark brown chalcedony. The stone is to be distinguished from jasper, which is an opaque variety of chalcedony, and from the Mexican onyx,—a form of aragonite, or carbonate of lime. The sardonyx derives its name from Sardis, reputed to be its original locality.

Sardou (*sär-dō̃*), **Victorien,** French dramatist, was born at Paris, Sept. 7, 1831. In his early student days, he desired to become a doctor, but abandoned medicine for literature and the writing of plays and comedies. His first production was a failure, but in 1860 he met with success in his next works — *Monsieur Garat* and *Les prés Saint-Gervais.* Even better received was his comedy *Les pattes de Mouche,* as were his numberless dramatic compositions which he wrote for Madame Berkhardt and others—*Fédora, Théodora, La Tosca, Gismonda,* etc. In 1891 he produced *Thermidor,* based on the French Revolution, but which was prohibited by the French government in the interest of public order. Other of his notable productions are *Nos Intimes, La famille Benoîton, Divorçons, Belle-Maman, Pamela, Cléopâtra,* and *La Marquise.* He also wrote a satire on American society, *L'Oncle Sam,* and many of his plays were produced with success in this country by Fanny Davenport, among which, especially, was his *Madame Sans-Gêne.* The plots of his comedies, as a rule, are slight, and rather improbable, but they are amusing and rapid in their action. Some of them are full of witty dialogue, with amusing hits at contemporary men of letters.

Sargas'sum, a genus ot brown seaweeds whose species are often observed floating in great masses in the large eddies formed by oceanic currents. These regions of comparatively stagnant water covered by the seaweeds are known as Sargasso seas, the prevailing type being a species of Sargassum. See PHÆOPHYCEÆ.

Sar'gon. See ASSYR'IA.

Sarma'tians, a race who spoke the same language as the Scythians. They were nomads, wild and savage in looks, good horsemen and bowmen, and dressed in leather armor. Their young women went into battle on horseback, which custom may have caused the Greek stories about the Amazons. They were made up of several tribes that roamed over the wide plains which stretch from the Vistula and the Danube to the Volga and the Caucasus. In the second half of the 4th century B. C., they conquered the Scythians. Their empire lasted till the 4th century A. D., when it was overthrown by the Goths.

Sarsaparil'la is the dried root of the smilax, a native plant of Central America. It is a twining shrub, which grows only where water is plenty. The brownish root is many feet long and about as thick as a goose quill. A liquid extract is used as a flavoring and a medicine.

Sar'to, Andrea del, a painter of Florence, where he was born in 1487 or 1486. His family name was Vannucchi, but he was nicknamed Del Sarto — "the tailor's son" — from his father's business. He painted two series of frescos in Florence, the best of the first series being *Nativity of the Virgin* and *Journey of the Three Kings.* He spent a year in Paris at the invitation of Francis I., and was very popular among the French. The most celebrated of his single pictures are the *Last Supper,* the *Madonna with the Harpies,* and *Fathers of the Church Disputing.* Del Sarto was a rapid worker, and excelled in accurate drawing. He died at Florence in 1531. See Crowe's and Cavalcasselle's *Painting in Italy.*

Saskatchewan (*sas-kach'ē-wan*), a large river of Canada, draws its waters from the Rocky mountains, and is formed by two head-

waters called the south and north branches. The north branch rises among the glaciers near Mt. Hooker, the south branch from a group of springs near the same locality, but a short distance to the south. The former has a course of 770 miles, the latter of 810 miles, before they meet. The river then flows east 282 miles to Lake Winnipeg, from which its waters are carried to Hudson bay by the Nelson river. Including the Nelson, its whole length is 1,514 miles. Steamers now run from Lake Winnipeg to Edmonton (700 miles); the Nelson is spoiled for navigation by rapids.

Saskatch'ewan, a western territorial district of Canada, lying to the north of Assiniboia, from the 52d parallel to about 53.30°. It is flanked by Alberta, Keewatin, and northern Manitoba. Both branches of the Saskatchewan river traverse the territory. The chief settlements are Prince Albert and Battleford. The district was organized in 1882, and has an area of 114,000 square miles, and a population of 13,000.

Sas'safras, the popular name and also the technical name of a genus which contains but a single species, native to eastern North America. The trees are usually small, but occasionally become 125 feet in height. The root is largely used for the aromatic oil.

Satellite (*sāt'ĕl-līt*), a small planet or moon. The term is generally employed in astronomy to denote one planet revolving about another; and hence satellites are sometimes called *secondary* planets, to distinguish them from the *primary*, or larger planets. One of the chief points of interest in connection with satellites is the fact that a satellite enables one to determine the mass of the primary as soon as the radius of its orbit, r, and its period, T, are known. For then, if we denote the mass of the primary by M and the mass of the secondary by m, we have

$$M + m = \left(\frac{2\pi}{T}\right)^2 r^3$$

and since m is practically always negligible in comparison with M. we have

$$M = \left(\frac{2\pi}{T}\right)^2 r^3$$

For a list of the known satellites see Webster's *Unabridged Dictionary*, article *Solar System*. On the evolution of satellites, see *Time and Tide*, by Sir Robert Ball ("Romance of Science" series).

Sat'inwood, the wood of *Chloroxylon Swietenia* from India. The wood is deep yellow and remarkably close grained, heavy, and durable.

Sato'lli, Cardinal **Francis,** a Roman Catholic prelate and diplomat of the papal see, was born at Perugia, Italy, July 21, 1831. He early in life distinguished himself as an orator and linguist, and on the accession of Pope Leo XIII. he was selected for the work of promoting theological studies at the college of the Propaganda at Rome. In 1888, he was created archbishop of Lepanto, and in the following year represented His Holiness the Pope at Baltimore, Md., on the occasion of the centenary of the Catholic hierarchy and on the inauguration of the Roman Catholic university at Washington, D. C. In 1893, he came again to this country as apostolic delegate with plenary powers, and in 1896 received the cardinal's hat. In the latter year he returned to Rome, leaving behind him as papal delegate in this country Sebastian Martinelli, archbishop of Ephesus. Cardinal Satolli is the author of a *Course of Philosophy* on the *Summa* of St. Thomas, and of essays on various philosophical themes.

Sat'urn, an early Italian god who presided over farming, his name coming from the word meaning "to sow." He most resembles Demeter of the Greek deities, but was later identified or confounded with the Greek Kronos. According to the Greek myth, Kronos the son of Uranos (heaven) and Gæa (earth) is the youngest of the Titans. He married Rhea by whom he had several children, all of whom he devoured at their birth except the last, Zeus (Jupiter), whom his mother saved by a stratagem. The motive of Kronos was his hope of bringing to naught a prophecy which declared that his children would one day deprive him of his sovereignty, as he himself had done in the case of his father Uranos; but fate is stronger even than the gods, and when Zeus had grown up he began a ten years' war against Kronos and the Titans, ending in their being hurled down to Tartarus and there imprisoned. Other myths added to this that after his banishment from heaven Kronos went to Italy, where Janus gave him a share in his sovereignty. In this way Zeus' conquest of Kronos, a Greek myth, became the Roman myth of Jupiter's conquest of Saturn. Saturn thus became a divine king, who ruled with a fatherly mildness the Italian natives and taught them agriculture. Hence the whole land received from him the name of Saturnia, or "land of plenty," and his reign was that "golden age" of which later poets sang. Saturn's temple, in Rome, stood at the foot of the Capitoline hill.

Sat'urn. See PLAN'ETS.

Saturnalia (*sat-ur-nā'li-a*), **The,** was most probably an old Italian harvest festival. During the festival slaves sat down to banquets in their master's clothes, while he waited on them at table. Crowds of people filled the streets, and roamed about the city in a peculiar dress; friends sent presents to each other; all business stopped; the courts closed; schoolboys got a holiday, and no war could be begun. The length of the Saturnalia varied at different times in Roman history, but they were usually held Dec. 17, 18, and 19.

The modern Italian carnival seems to be founded on the old pagan Saturnalia.

Satyrs (*sā'tẽrs*), in Greek myth, were a race of woodland deities, half human, half animal. They are generally described as roaming the hills in the train of Dionysus (Bacchus). They looked grotesque and repulsive. They were of robust build, with broad, snub noses, large, pointed ears, bristly and shaggy hair, rough skin, little horny knobs on their foreheads, and small tails. They were fond of the woodland nymphs, of music, dancing, wine, and sleep. They were usually hostile to man. The Roman poets represented them as the same as the fauns of their own myths, and gave them larger horns, and goats' feet. Satyrs were often sculptured; for example, Praxiteles' famous *Satyr* at Athens.

Saul, the first king of Israel, was the son of Kish, a wealthy chief of the tribe of Benjamin. Gigantic in frame, noble in mien, and commanding in character, he was well fitted for the task of uniting the tribes of Israel. His deliverance of the men of Jabesh Gilead, and his victories over the Philistines, Ammonites, and Amalekites were unmistakable proofs of his ability as a soldier. But soon he became possessed of a wild madness which found vent in an insane jealousy of David, his son-in-law and the chief of his bodyguard, and in a fit of rage attempted his life with his own hand. Saul fell in a disastrous and bloody battle with the Philistines on Mt. Gilboa.

Sault (*sō*) **Ste. Marie,** a port of Michigan, on the St. Mary river, near the outlet of Lake Superior, 290 miles northwest of Detroit. A canal around the rapids or sault passes yearly nearly three times as many boats as the Suez canal. An immense iron bridge connects the railroads from St. Paul and Duluth with those of Ontario. Population in 1900, 10,538.

Savan'nah, a city and port of Georgia, stretches several miles along the Savannah river, 18 miles from its mouth and 115 miles southwest of Charleston. It is built on a sandy plain, 40 feet above the river, with broad streets shaded by beautiful trees. Forsyth Place, covering thirty acres, and thickly planted with forest pines, is almost in the center of the city. Here is a monument to the Confederate dead, and there are others in the city to Gen. Nathaniel Green and Count Pulaski, who fell here. Savannah has electric cars and electric lights. The custom-house, city exchange, cotton exchange, a Roman Catholic cathedral, and Christ church, on the site where John Wesley first preached to the colonists, are among the main buildings. The city annually spends $120,000 to maintain its public schools, that have a teaching force of 177, and an attendance of 8,697 pupils. The colored people have churches and good schools for themselves. Savannah has long been the first naval stores station and second cotton port of the continent; the yearly export of cotton is over $27,000,000. The whole business of the port amounts to $134,000,000 yearly. There are also rice, paper, flour, planing, cotton, and other mills. Savannah was founded in 1733. It was taken by the English in 1778, and by General Sherman in December, 1864. Population 54,244.

Savan'nah, a river which with its right branch forms the boundary line between Georgia and South Carolina, rises near the southern border of North Carolina and flows southeast to the Atlantic. It is 450 miles long, and is navigable from November to June for large vessels to Savannah, and for steamboats to Augusta.

Save (*sāv*), a river in South Austria, an important branch of the Danube, rises in Carniola, crosses Croatia, separates Bosnia and Servia on the south from Slavonia on the north, and falls into the Danube at Belgrade. It is 556 miles long and is navigable for 336 miles to Sissek in Croatia.

Savonarola (*sä-vō-nä-rō'lä*), **Girolamo,** an Italian reformer, was born at Ferrara, Sept. 21, 1452. He was taught at home, and in 1474 entered the Dominican order at Bologna. He first preached at the Dominican convent of San Marco in Florence in 1482, where his harsh voice, and lack of the graces of a speaker, caused his lectures to be deserted. After a seven years' absence in another convent, he appeared again before the Florentines, and this time his sterling genius and enthusiasm gained him complete success, as he preached against the sins and luxuries of Florence, then at the height of its wealth and brilliancy, under Lorenzo the Magnificent. At this time he stood well with the government and the church, the pope appointing him vicar-general to carry out a reform Savonarola had proposed of the Dominican order in Tuscany. But about 1493 he began to preach pretty plainly at the government and in one of his sermons he referred to the coming of the French under Charles VIII.; and when what he had foretold happened, Savonarola was one of the committee sent to welcome the French king as the saviour of Italy. When the French were forced to leave Florence, a republic was established, of which Savonarola became, though without holding any office, the guiding spirit, his party, who were called Piagnoni, or "Weepers" from the character of penitents which they professed, being in power. Savonarola now aimed at making Florence a model of a Christian commonwealth. Gambling and other vices were sternly punished; vanities of dress were ruled by law; and under the enthusiasm which this prophet stirred among the people women flocked in troops to the public square to fling down their costliest jewelry, and his followers made a "bonfire of vanities," including cards, dice, and carnival costumes. Mean-

while, his denunciations which did not spare even the pope himself — Alexander VI. — and his followers' claim that he was a heaven-sent prophet, arrayed the church against him. He refused to go to Rome to awswer a charge of heresy, likewise refused a cardinal's hat offered him if he would change the style of his preaching, and kept on preaching when forbidden by the pope. He was then excommunicated; the elections at Florence were carried by the party called the Arrabbiati or the "enraged," that is, against Savonarola's upright but vigorous government; and lastly, a Franciscan preacher having denounced him, an appeal was made to the ordeal of fire, a Franciscan and a Dominican monk agreeing to make a trial of this dread ordeal to prove which side in this quarrel was favored by Providence. The trial was not made, owing to difficulties and disputes, the failure destroying Savonarola's prestige among the people. No longer having the support of Florence, he was tried by the church council, tortured, and condemned as a heretic and an enemy of the state. So, on May 23, 1498, this extraordinary man and two other Dominicans, Domenico and Silvestro, were strangled and their bodies burned by the executioner. See his *Life*, by Villari (English translation); Mrs. Oliphant's *Makers of Florence*, and George Eliot's *Romola*.

Saw'fish, a cartilaginous fish related to sharks and rays, with the snout prolonged into a bony blade and sharp teeth along each edge. The body is shaped like that of a shark, and the saw sometimes reaches a length of six feet. There are from sixteen to twenty pairs of teeth in the different species. These fish are normally inhabitants of warm seas. They are abundant in the Mediterranean, and are also found about the West Indies, and off the southern coast of North America. They attack whales and large fish. With the saw they rasp off flesh which is eaten, and sometimes they rip open their prey. Their nostrils, and mouth with small teeth, are located on the under surface of the head near the base of the saw.

Saxe (*saks*), **John Godfrey,** was born at Highgate, Vt., June 2, 1816. He graduated at Middlebury college, Vermont, in 1839, became a lawyer and for seven years practiced in his native county. For six years he owned and edited a newspaper at Burlington. He also served a year as state's attorney and ran for governor of Vermont on the Democratic ticket in 1859 and 1860. Saxe's poetry was mostly satirical and soon gained great popularity, his first volume of poems going through over forty editions. Among his verses are *The Proud Miss McBride*, *The Money King*, and *New Rape of the Lock*. Saxe died at Albany, N. Y., March 31, 1887.

Saxe, Maurice, Marshal, a celebrated soldier of the 18th century, was the natural son of Augustus II., elector of Saxony, and the countess of Königsmark, and was born at Goslar, Hanover, Oct. 28, 1696. When only twelve years old he ran away from home to Flanders, joined the army of Marlborough, and took part in the capture of Lille and the siege of Tournay. With a boyish love of change he joined the Russo-Polish army in 1711 and distinguished himself under his father's own eyes. After fighting against the Turks in Hungary, he was chosen in 1726 duke of Courland, and for three years stubbornly defended the duchy against both Russians and Poles. At length, forced to give it up, he fought under the duke of Berwick, and decided the battle of Ettlingen by a desperate charge. On the breaking out of the Austrian war of succession he was given command of an army to invade Bohemia, stormed Prague, and captured Egar. In 1744, he was made a marshal of France, put in command of the French army in Flanders, and with masterly genius kept a much larger force of the enemy inactive, at the same time capturing various important fortresses. The following year was for him more glorious still; he defeated the duke of Cumberland at Fontenoy, thus winning one of the greatest French victories over the English. The next year he won against the allies the brilliant victory of Raucoux, and the year after for the third time defeated Cumberland at Laufeldt, and forced the allies to agree to the treaty of Aix-la-Chapelle. Saxe died Nov. 30, 1750. George Sand was Saxe's great-granddaughter. See Carlyle's *Frederick the Great*.

Saxe-Coburg-Gotha (*kō'burg-gotä'*), a duchy in Thuringia, one of the German states, area 755 square miles, with a population of 230,000. The principality consists chiefly of two detached portions, the duchy of Gotha in the north and the duchy of Coburg in the south, the chief towns of which are Gotha (population 31,671), and Coburg (population 18,689). The reigning family was, until 1893, represented by Duke Ernest II., who was succeeded by his nephew Prince Alfred of England, duke of Edinburgh, who died in 1900. A son of the latter, heir presumptive, having died in 1899, the duke of Connaught became heir to the ducal throne; but as he, with his son, renounced all claim to the succession, the throne fell to the present incumbent, Charles Edward, son of Prince Leopold (duke of Albany). The latter, being still a minor (he was born in 1884), the duchy is administered by a regent, the hereditary Prince Ernest of Hohenlohe. There are 173 miles of railway in the duchy, its chief products being agricultural — the crop consisting largely of rye, wheat, and barley.

Saxe-Meiningen (*saks-mī'ning-en*), a duchy in Thuringia, one of the states of the German empire. The charter of the duchy dates from 1829; its capital is Meiningen (population 12,869). The reigning duke is George II., son of Duke Bernhard I., who

succeeded on the abdication of Duke Bernhard in 1866. The area of the duchy is 953 square miles, with a population, almost entirely Protestant, of 234,005. Like the duchy of Saxe-Coburg-Gotha, its products are mainly agricultural, the chief crop being rye, oats, wheat, hay, and potatoes. It has 150 miles of railways.

Saxe-Weimar (*saks-vī'mär*), a grand-duchy of Thuringia, one of the German states, whose constitution dates from 1816. Its area (1,388 square miles, with a population of 362,018) consists of three detached districts — Weimar, Eisenach, and Neustadt. The capital is Weimar (population 26,670), and the reigning grand-duke is Wilhelm-Ernst (born 1876), son of the late Prince Karl August, who succeeded Jan. 7, 1901, on the death of his grandfather, the late Grand-Duke Karl Alexander. The government is an hereditary constitutional monarchy. The chief occupation of the people is agriculture, though there are some manufactures, mainly cotton and woolen.

Sax'horn, the name of a series of brass wind musical instruments invented by Antoine or Adolphe Sax, who was born at Dinant, Belgium, in 1814, and settled at Paris in 1842. By means of this and another family of instruments called saxophones, he has greatly influenced military music throughout the world. The saxhorn is a conical tube opening out to a wide bell, is sounded through a cupped mouthpiece, and is provided with valves or pistons like a cornet. Saxhorns are made in different sizes, the series having a very wide compass. Their number and variety supply all the different parts required by a brass band, and in many places good bands are wholly made up of them. From the fact that their fingering is all alike, a performer having mastered one can by a little practice play as well on any of the others. Their compass, richness, and flexibility of tone render them especially fit for military music, and their form makes them easy to play either on the march or on horseback.

Sax'ons, a Germanic people, whose name is thought to come from an old word meaning "knife." A "Saxon league" was formed in the 3d century of tribes living along the Elbe inlet and on the neighboring islands. The Saxons invaded Roman territory in the reigns of Julian and Valentinian, and about 450 they, together with the Angles, conquered settlements in England and founded the Anglo-Saxon kingdoms. Before the fifth century they had settled along the sea coast from the Elbe to the Loire, but these settlements soon became a part of the kingdom of the Franks. At home the Old Saxons widened their country till it embraced all the lands between the Rhine and Elbe, the North sea and the Hartz mountains. Saxons and Franks together destroyed the Thuringian kingdom in 531. The Frankish war of conquest was waged against the Saxons from 719 to 804, the Franks at last conquering under Charlemagne, in spite of the stubborn defense of the Saxons under their leader Wittekind. The Saxons gave up their pagan worship with their freedom, and accepted Christianity.

Sax'ony, a German kingdom, in area the fifth, and in population the third state of the empire; it covers 5,787 square miles, and has a population of 4,199,758. For the present state of Saxony, see GERMAN EMPIRE.

After the division of the territories ruled over by Charlemagne, the Frankish conqueror of the Saxons, that nation became a part of Austrasia. Its first duke was Otto (880–912). His son Henry made himself master of all the territories included in the present kingdom of Saxony, the Prussian province of Saxony, the smaller Saxon duchies, and more besides. The German emperors, after 1024, were Franks and their greatest enemies were the Saxon dukes, especially Henry the Proud of Bavaria, and Henry the Lion, Rudolph II. (1356–70), first took the title of Elector of Saxony. During the Thirty Years' war, the elector John George I. (1611–56) sided with the Protestants, but in 1635 made his peace with the emperor, on which account his lands were ravaged by the Swedes for the next ten years. Frederick Augustus I. (1694–1733) became a Catholic and was chosen king of Poland. After that the headship of the Protestant states of Germany passed to the elector of Brandenburg, and to this day the court of Saxony is Catholic. Saxony waged war against Charles XII. of Sweden and suffered greatly at his hands; was defeated by Prussia in the second Silesian war, and was conquered by Frederick the Great in the Seven Years' war. Frederick Augustus III. (1763–1827) proclaimed himself king of Saxony, and sent his army to support Napoleon. For this reason the congress of Vienna took from him over half his territory to form the new province of Prussian Saxony. In the Austro-Prussian war of 1866, Saxony sided with Austria, was defeated, and joined the North German confederation. In the Franco-Prussian war the Saxon army fought on the side of Prussia, and since 1871 Saxony has been a part of the German empire.

Saxophone (*saks'o-fōn*), the name of a group of musical instruments invented by Adolphe Sax. (See SAXHORN.) The saxophone is a conical brass tube, sounded by a mouthpiece furnished with a single reed like that of a clarinet, and is made in as many different keys as the saxhorn. It has twenty holes covered by keys and studs, for the first three fingers of each hand. All the different saxophones are fingered alike. They are greatly valued in military music, but are not much used in orchestras.

Sax'ton, Joseph, American inventor, was born at Huntingdon, Pa., March 22, 1799, and died at Washington, D. C., Oct. 26, 1873. At an early age he showed much mechanical ingenuity, which manifested itself later in inventions and improvements in connection with the mechanism of clocks; he constructed the clock for the tower of Independence Hall, Philadelphia, and superintended the construction of the machinery and delicate weighing balances for the Philadelphia mint. He spent some years, early in the thirties, in England, and while there constructed a magneto-electrical machine, by which the first magnetic spark was obtained; he made much of the apparatus used by Wheatstone, the physicist and inventor, and devised a locomotive differential pulley. Among his other inventions were a deep-sea thermometer, an immersed hydrometer, and a self-registering tide-gauge. He was one of the founders of the American Academy of Sciences.

Sayce (*sās*), **Archibald Henry,** one of the greatest of living philologists, was born at Shirehampton, England, Sept. 25, 1846. After attending Grosvenor college at Bath, he entered Queen's college, Oxford, in 1865, and became a fellow and tutor of his college. In 1876, he was appointed assistant to Max Müller in the chair of comparative philology at Oxford, which position he resigned in 1890. Professor Sayce was made a member of the Old Testament revision committee in 1874. The most important among his many books, which rank among the first in scholarship and value, are *The Ancient Empires of the East*, *Fresh Light from the Monuments*, *The Hittites*, and *The Races of the Old Testament*.

Scale (in plants). The word has two applications. Epidermal outgrowths, which technically are "hairs," sometimes assume the form of scales which more or less overlap one another. The more general application of the term, however, is in connection with the protecting leaves of scaly buds or the reduced leaves of underground stems. Such leaves are not green, are not much developed, and are often firmer than ordinary leaf tissue. The scales of underground stems are probably merely reduced leaves, with no function; the scales of aerial buds, however, are distinctly protective organs, and are not only firm and resistant, but are frequently covered with hairs or gummy products.

Scale Insects, the name of a large number of flat insects, with scale-like bodies. They are often injurious to fruit and shade trees, as well as to smaller plants. The cottony-cushion scale did a great amount of injury to trees in California, and was combatted by introducing a ladybird which preyed upon it. A scale insect which forms a large cottony egg-case, making it a conspicuous object on the trees, has recently done much injury to maple trees in various parts of the United States. The scale insects infesting the orange and lemon trees have done much damage. The bark-lice and the insects which furnish cochineal also belong to this group.

Scal'lop (*skŏl'lŭp*), the name of a number of widely distributed and well-known mollusks inhabiting salt water. Their shells are marked with radially arranged ridges and are often bright colored. The animal living within is somewhat like a clam, with a slender foot, orange or reddish in color. The mantle, which covers the animal and secretes the shell, is provided with many small sparkling eyes arranged around the margin. These show when the shell is open. When young, scallops swim by opening and shutting the valves of their shells, but as they grow older, they become sedentary. The larger scallop shells are often used for baking and serving shredded fish and oysters in cracker crumbs.

Scalp, the outer covering of the skull. The skin of the scalp does not differ from that of the rest of the body, except that hair grows on it more abundantly. Besides the skin, the scalp is formed of an expanded muscle or tendon and cellular tissue and blood-vessels. Scalping was a favorite practice of the American Indians in war, in which the scalp with the hair attached was partly cut and partly torn away, the victim being either alive or dead during the operation. The scalps were worn as trophies by the warriors.

Scan'derbeg (Iskander Beg or Bey), an Albanian chieftain, was born at Albania, about 1403, of Servian parents. He was called George Castriota, by the Christians. He was carried away by the Turks when seven years old, and brought up a Mohammedan. His bravery and skill made him a favorite with the sultan, who put him in command of a division of his army. In 1443, he deserted the Turkish army with 300 Albanians, and renounced Mohammedanism. In less than a month, the whole of Albania was in arms, Scanderbeg was chosen chief, and the Turkish garrisons driven out of the country. He was never defeated by the Turks but once, in all the struggles that followed, destroying an army of 40,000 Turks, with 15,000 Albanians, and defying the sultan himself with his army of 150,000, until he retired disgusted from the conflict. Pope Pius II. tried in vain to league the Christian princes together to help Scanderbeg in his conflicts with the Turks, but succeeded in inducing him to break a truce of peace, made in 1461, and renew the war alone. He again defeated every force that attacked him, even driving back Mohammed II., the conqueror of Constantinople, who conducted two campaigns against him in person. Scanderbeg died at Alessio, of malarial fever, Jan. 17, 1468.

Scandina'via, a long peninsula in the north of Europe, lying on the Arctic ocean, the Norwegian sea, the Baltic sea, and the gulf

of Bothnia. Geographically it includes Norway and Sweden, and historically Denmark and Iceland, while its literature includes the literary work of the Swedish race in Finland. See NORWAY, SWEDEN, and LITERATURE.

Scarabæus (*skăr'a-bē'ŭs*), a name commonly restricted to the tumble-bugs or dung-beetles, but properly including other members of the large family *Scarabæidæ*. The tumble-bugs form round balls of dung and roll them to considerable distances, and finally bury them in the ground. The female lays an egg in this mass, which serves as food for the larva after the egg hatches. The most famous scarab is the sacred beetle of the ancient Egyptians. These were highly venerated and placed in tombs with their dead, where four different species have been preserved. A strange symbolism grew up in reference to these insects. The ball they rolled was taken to represent the earth, the rayed head of the insect the sun, the thirty joints in their six tarsi the days of the month, etc. They became accepted as emblems of power and resurrection. They are found sculptured on monuments and tombs. Gems were also cut in the form of the scarab and worn in rings and amulets. The Greeks and Etruscans borrowed this custom of engraving the scarabæus on gems.

Scar'let Tan'ager. See TANAGER.

Schaff (*shăf*), **Philip,** an American theologian, was born at Coire, Switzerland, Jan. 1, 1819. He studied at Tübingen, Halle, and Berlin, and was a privat-docent or tutor at Berlin, when he was recommended in 1843 by Neander and Tholuck, for a professorship in the Theological Seminary of the German Reformed church at Mercersburg, Pa. In 1869, he was made a professor in Union Theological seminary, New York city. He was one of the founders of the American branch of the Evangelical Alliance, and president of the American committee for revising the Old Testament. He has written *History of the Christian Church* in five volumes, *Creeds of Christendom*, *The Person of Christ*, and many other theological works, besides editing a large number of religious and philosophical volumes. He died at New York, Oct. 20, 1893.

Schauffler (*shawf'-fler*), **William Gottlieb,** a missionary, was born at Stuttgart, Wurtemberg, in 1798. He came to the United States to study in 1827, and took a theological course at Andover seminary, where he decided to devote his life to mission work, intending to labor among the Jews. His labors in Constantinople among the Jews and Armenians lasted forty-four years, during which he translated the Bible into Turkish and also into Hebrew-Spanish. He was remarkable for his knowledge of foreign tongues, speaking ten languages and reading easily at least twenty. He died in New York in 1883.

Scheffer (*shĕf'er*), **Ary,** a painter, was born at Dordrecht, Holland, Feb. 12, 1795, and studied in Paris. His first works were inspired by Goethe's, Byron's, and Dante's works, and included *Margaret at the Well*, *Faust in His Study*, *Suliote Women*, and the well-known *Dante and Beatrice in Heaven*. After 1835, he turned to religious subjects, painting his *Christus Consolator* (Christ the Consoler), *Temptation of Christ*, *St. Augustine and Monica*, and others. Some of his best portraits are those of Lafayette, Madame Guizot, Talleyrand, Liszt, and Lamartine. He died at Argenteuil, near Paris, June 5, 1858. See *Memoir*, by Mrs. Grote.

Scheldt (*skelt*), a river of Europe, rising in France, flowing north through Belgium, past Ghent and Antwerp, enters the North sea at Flushing by two arms, going north and south of two small islands. It is 267 miles long, and navigable for 211 miles. The Dutch claimed the navigation of the lower Scheldt in the 17th and 18th centuries and demanded toll of all foreign vessels sailing on it. In 1831, the rights passed to Belgium when it was separated from Holland. In 1863, Belgium gave up the claim for the sum of $3,750,000 paid to it by foreign nations.

Schelling (*shĕl'ing*), **Friedrich Wilhelm Joseph,** a German philosopher, was born at Wurtemberg, Jan. 27, 1775. He studied theology and philosophy at Tübingen and science and mathematics at Leipsic. He succeeded Fichte as teacher of philosophy in the University of Jena in 1798. From 1803 to 1808 he was professor at Wurzburg; until 1820, secretary of the Royal Academy of Arts at Munich; professor at Erlangen until 1827, when he returned to Munich to a position in the new university there, and finally was called to Berlin by King William IV. in 1841. He died in Switzerland in 1854. He began as a follower in philosophy of Fichte and Hegel, with whom he ranks among German philosophers, but later was influenced by Spinoza and Brehme. The large number of his philosophical works include the *Inquiry into the Nature of Human Freedom*, *On the Possibility of Any Form of Philosophy*, *Philosophy of Nature*, and *The World Soul*. See *History of Philosophy*, by Morell.

Schenck (*skĕngk*), **Robert Cumming,** American soldier and diplomat, was born at Franklin, O., Oct. 4, 1809, and died at Washington, D. C., March 23, 1890. He was educated at Miami university, studied law, and for a time practiced at Dayton, O. He served some eight years in congress (1843–51) when he was appointed United States minister to Brazil. He was afterward sent on diplomatic missions to Buenos Ayres, Montevideo, and Paraguay. In the Civil war, he was appointed (May, 1861) brigadier-general of

volunteers and took part in the two battles of Bull Run, as well as in that at Cross Keys. He had his right arm shattered by a rifle ball. In September, 1862, he was promoted major-general and given command at Baltimore, which he protected during Lee's invasion of Maryland. From 1863 to 1871 he represented Ohio in congress on the Republican side and from 1871 to 1876 was United States minister to Great Britain. He subsequently practiced law at Washington, D. C.

Schenectady (*ske-nĕk'ta-dĭ*), a city of New York, is on the Mohawk river, 17 miles northwest of Albany. It is on the Erie canal and is a manufacturing town, with the works of the Westinghouse company, the General Electric company, knitting mills, stove foundries, locomotive works, and pumps, steel springs, wire railings, and wheelbarrow, and broom factories. It is the seat of Union college, founded in 1795, and forming, with the law and medical schools and Dudley observatory at Albany, Union university. Its buildings are on a hill overlooking the city. Schenectady was settled by the Dutch in 1661. In 1690, it was burned and the citizens massacred by the French and Indians. Population 31,682.

Schiller (*shĭl'er*), **Johann Christoph Friedrich,** a German poet, was born at Marbach, in Wurtemberg, Nov. 10, 1759. He studied first law and then medicine, in the school at Ludwidgsburg, established by Duke Carl Eugen of Wurtemberg, where he received three medals, though he had spent more time in reading and writing poetry than he had in studying medicine. His first play, *The Robbers*, in 1782, was produced at Mannheim. The people were so eager for it that they filled the theatre at noon, five hours before the play began, and it made a tremendous sensation, being full of the revolutionary spirit that preceded the French Revolution. Because Schiller had twice left Stuttgart without the permission of the duke, he was arrested, and forbidden to write plays or to leave Wurtemberg, which led to his flight to Mannheim under the name of Dr. Ritter. He was for a year dramatist to the theatre in Mannheim, and also published a theatrical journal, in which appeared many of his best poems, and a part of *Don Carlos*, finished later at Dresden. He kept up his philosophical and historical studies, and in 1788 was given a professorship at Jena, and a pension by the duke of Saxe-Weimar, which enabled him to marry. His historical works of this period are the *Revolt of the Netherlands*, and the *Thirty Years' War*. In 1794, began Schiller's friendship with Goethe, and under the stimulus of his intercourse with him, he began again writing poetry, especially his ballads, that have made him the popular poet of Germany. His drama of *Wallenstein*, written when every hour's writing cost him hours of suffering, was finished in 1799. Carlyle calls it "the greatest dramatic work of the 18th century." Settling at Weimar in 1799, to be near Goethe, he wrote *Mary Stuart*, *The Maid of Orleans*, *The Bride of Messina*, and *William Tell*, his last finished work. He died while still young, and in his intellectual prime, May 9, 1805. See *Life*, by Carlyle, and *Life*, by Nevinson, in the "Great Writers" series, and *Wallenstein's Death* and *Piccolomini*, by Coleridge.

Schlegel (*shlā'gel*), **August Wilhelm,** a German critic and poet, was born at Hanover, Sept. 8, 1767. He studied theology at Göttingen, but soon turned to literature, writing poems and other articles for magazines. He was made professor of literature and fine arts at the University of Jena, and lectured at Berlin on the same subjects and at Vienna in 1808. In 1818, he became professor at Bonn. He translated into German verse most of the works of Shakespeare, and many of those of Cervantes, Dante, Calderon, and Camoens. His translation of Shakespeare, revised by Tieck, is still the classic German version. Heine attended Schlegel's lectures at Bonn, and thus describes the professor lecturing to his class: "He wore kid gloves and was dressed after the latest Paris fashion, and when he spoke of the English lord of the treasury, always begun with the words 'My friend.' Beside him stood his servant, dressed in the grand livery of the house of Schlegel; his business was to snuff the wax candles in the silver candlesticks that stood, along with a glass of 'sugared water,' on the desk before him, the 'genius of the age.'" His critical writings and his lectures were published in three collections. He died at Bonn, May 12, 1845.

Schle'gel, Friedrich von, German critic and writer, was born at Hanover, March 10, 1772. He studied at Göttingen and Leipsic, and then began a literary life. He edited with his brother, August Wilhelm, the journal, *The Athenæum*, and also in connection with him, wrote a series of critical essays, which gave an impulse to good work in German literature. From 1808 until 1829, he had a government position in Austria, and wrote the proclamations of that empire against Napoleon. His best known works are *Philosophy of History*, and *History of Literature*, two series of lectures delivered at Vienna. His book on *The Language and Wisdom of India* is the pioneer in the study of Sanskrit in Europe. His works are collected in fifteen volumes. He died at Dresden, Jan. 11, 1829.

Schleiermacher (*shlī'er-mā'ker*), **Friedrich Ernst Daniel,** a great German theologian, was born at Breslau, Prussia, Nov. 21, 1768. He studied at the Moravian schools and afterward at Halle. While preaching at Berlin, he published the first of the works which made him known to the learned world.

In 1804, he became a professor at Halle. After that university was closed, in 1806 by Napoleon, he returned to Berlin and was active in founding the University of Berlin in which he became a professor in 1810. His lectures on philosophy and theology brought crowds of students, and his sermons increased his influence. His writings also continued, and besides many theological works published before his death, which placed him next to Luther as a theologian, his friends published several volumes from his manuscripts. He died Feb. 12, 1834. See *History of German Theology in the Nineteenth Century*, by Lichtenberger; and *Autobiography*.

Schley (*sli*), **Winfield Scott,** rear-admiral United States navy, was born near Frederick, Md., Oct. 9, 1839. He graduated from the Naval academy in 1860, and served during the Civil war. He was in command of the Greely relief expedition which sailed in 1884. As commodore he was placed in command of the flying squadron in the War with Spain, and for conspicuous service in the battle of Santiago, (July 3, 1898) he was made rear-admiral. In the autumn of 1901, Admiral Schley figured in a Court of Inquiry arising out of professional controversies between himself and Admiral Sampson respecting the share of honors each was entitled to in the destruction of the Spanish fleet off Santiago de Cuba.

WINFIELD S. SCHLEY.

Schliemann (*shlē'män*), **Heinrich,** a German scholar, born at Mechlenburg-Schwerin, Jan. 6, 1822. While in business in St. Petersburg he mastered Greek and the modern languages of Europe. Becoming convinced that the heaps of Hissarlik in Asia Minor covered the site of ancient Troy, when he possessed an independent fortune, he began in 1870 to excavate it at his own cost, carrying on the work for twelve years. He had to pay the Turkish government $10,000 for carrying off all the treasures he unearthed, contrary to agreement. His collection is now in the Ethnological museum at Berlin. In 1876, Schliemann began excavations on the site of the ancient city of Mycenæ, in Greece, and the treasures found there are now preserved at Athens. He wrote an account of his work in *Mycenæ and Tiryns*, *Ilios*, *Troja* (Troy), and other volumes. He died at Naples, Dec. 27, 1890, and was buried at Athens.

Schmalkald (*shmäl'käld*), **League of,** an alliance formed at Schmalkalden, a town in Hesse-Nassau, Germany, April 4, 1531, between nine Protestant princes and eleven imperial cities. Other princes and cities afterward joined the league, until it included nearly all the Protestant states from Denmark to Switzerland. The object of the league was the protection of the Protestants against Charles V. and the Catholic states. The *Articles of Smalkald*, adopted by the league, were drawn up by Luther at Wittenberg. At the battle of Mühlberg, April 24, 1547, the Protestants, weakened by the withdrawal of Duke Maurice of Saxony, were defeated and the league was broken up.

Schnitz'ler, Eduard. See EMIN PASHA.

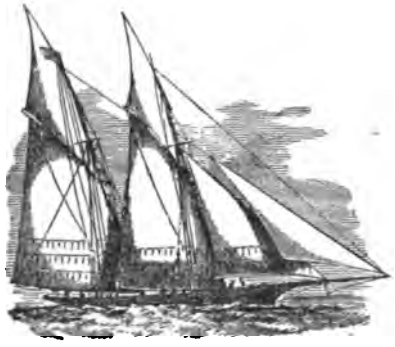
Scho'field, John McAllister, an American general, was born in New York state in 1831. A graduate of West Point, he was made a professor there in 1855. When the Civil war broke out, he entered the army as major of the 1st Missouri volunteers, and was on General Lyon's staff when the latter was killed at the battle of Wilson's creek. He was in command in Missouri until February, 1864, and then of the army of the Ohio. He shared Sherman's southern campaign, and was in most of the battles which ended with the taking of Atlanta, when he returned to Tennessee, defeating Hood at Franklin, and was with General Thomas at the battle of Nashville. Entering North Carolina, he took Wilmington, and again joined Sherman, for whom he drew up the supplementary articles of surrender of Johnston's army, which were afterward approved by the government. In 1868, he became secretary of war, and major-general in the regular army. Upon the death of General Sheridan, 1888, he succeeded to the command of the United States army. Previous to his retirement, he was, by act of congress, made lieutenant-general, Feb. 7, 1895. He is the author of a biographical narrative, entitled *Forty-six Years in the Army*.

GENERAL SCHOFIELD.

School'craft, Henry Rowe, an American writer, was born in the state of New York, March 28, 1793. After studying at Union college, he visited the mining region west of the Mississippi, and also acted as geologist in an exploring expedition to Lake Superior and the Upper Mississippi under General Cass. In 1822, he was Indian agent for the tribes about the lakes, and married in 1823 the granddaughter of an Ojibway chief who had been educated in Europe. While Indian agent he made treaties that gave the United States 16,000,000 acres. As a member of the legislature of Michigan territory, from 1828–32, he founded its historical society. An expedition which he commanded in 1832 discovered the sources of the Mississippi. After collecting

the statistics of the Six Nations, he was employed by congress in 1847 to gather all the information possible about the Indian tribes, the result being published in five volumes, costing the government $30.000 a volume. He added a sixth volume to the collection in 1857. His works include narratives of his journeys—*Notes on the Iroquois, the Red Race of America, Thirty Years with the Indian Tribes*, and *The Indian in His Wigwam*. He died at Washington, D. C., Dec. 10, 1864.

Schoon'er. See SHIP.



SCHOONER.

Schopenhauer (*shō'pen-how'er*), **Arthur,** a German philosopher, was born at Dantzic, Prussia, Feb. 22, 1788. His mother was a writer and a friend of Goethe's. His father, a banker, trained his son for a business career by study and foreign travel, but after his death, the son having a small income, decided on a literary life and studied at Göttingen, Berlin, and Jena, hearing Fichte and Schleiermacher lecture. From Weimar, where his mother resided, he went in 1814 to Dresden, and from there to Italy, afterward living at Berlin and Frankfort-on-the-Main. His chief book, *The World as Will and Idea*, gives a large part of his peculiar philosophy, which he thought was the only worthy successor to that of Socrates, though for sixty years it failed of recognition, while what he considered the ravings of Fichte, Schelling, and Hegel were praised as the highest wisdom. *On the Will in Nature, Seeing and Colors*, are among his philosophical writings, which include also many occasional papers, and his prize essay in the Norwegian academy on *Freedom of the Will*, which brought him the first public praise. His life was a solitary one, as his mother could not live with him, and, despising women, he never married, and had no intimate friends. He died Sept. 21, 1860. See *Lives*, by Zimmerman and by Wallace.

Schubert (*shō'bert*), **Franz Peter,** a celebrated musical composer, was born at Vienna, Jan. 31, 1797. Before he was eleven years old he was singing in a church choir, and was soon sent to the chorister's school of the court chapel, where he became leader of the school band. The boys of the school had very little instruction and went hungry and cold, but Schubert's desire for composition kept him at work for the five years spent in the institution. The *Erl King*, his immortal song, was composed when only eighteen, and the *Mass in F*, while teaching in his father's school at Lichtenthal. His musical friends seem to have helped him for a few years, both in giving him lodgings and in making his work known to the public. In 1819, one of his songs, *The Shepherd's Lament*, was given at a concert at Vienna, and his comic operetta, *The Twins*, was produced at the theatre there. As his songs became known, the enthusiasm with which they were received made publishers ready to accept his manuscripts, and as many as twenty songs were published in eight months. He made a tour with Vogl in 1825, delighting everyone with the performance of Schubert's seven songs from the *Lady of the Lake*, though the songs were afterward sold for only $100. He gave his first and only concert in Vienna in 1828, which was so successful as to put the needy composer, who had been selling some of his best songs at a penny, beyond want for a time. His musical productions are very numerous, as he wrote rapidly and steadily, sometimes composing six or seven songs in a morning. Everything he saw, or heard, or read, suggested a subject to him; one of his piano duets was inspired by the song which he heard sung by a Hungarian girl as he passed the kitchen door, and his *Hark! Hark! the Lark*, flashed over him in a beer-garden. His songs are among his finest work; Beethoven, who saw them only on his death-bed, saying: "Surely Schubert has the divine fire." His compositions include more than 500 songs, ten symphonies, six masses, several operas, cantatas, and a host of sonatas. He died in his thirty-second year, Nov. 19, 1828. See *Life*, by Frost.

Schumann (*shō'măn*), **Robert,** a German musician, was born at Zwickau, in Saxony, June 8, 1810. He began his musical studies in Leipsic, and in his haste, besides constant practicing, tried some mechanical means for increasing the power of his hands, which resulted in a permanent injury to the right hand, and compelled him to turn his attention to composition. For ten years he edited a musical journal, composing at the same time some of his best pianoforte works. Mendelssohns' coming to Leipsic in 1835 resulted in making it the musical center of Germany, and Schumann was at once one of his worshipers. His last years, in which he produced some of his best works, such as the *Quintette* for pianoforte and strings, *Paradise and the Peri, Genoveva*, etc., were clouded by brain trouble, ending in insanity. The two last years of his

life were spent in a private asylum near Bonn, where he died July 29, 1856. His wife, a fine pianist, labored incessantly to have his works acknowledged, performing them in the chief cities of Europe with splendid success. She lived to see him ranked among the great composers. See *Life*, by Wasielewski.

Schur'man, Jacob Gould, American educator, president of Cornell university, was born at Freetown, Prince Edward island, Canada, May 22, 1854, and was educated at Acadia college, Nova Scotia, graduated at London university, and pursued his studies at Paris and at Edinburgh, Scotland. He also took special courses at Heidelberg, Berlin, and Göttingen, and on his return to this continent he became professor of philosophy and English literature in two of the colleges of the Canadian maritime provinces. In 1886, he was appointed Sage professor of philosophy and dean of the Sage school in connection with Cornell university. In 1892, he became president of Cornell, and at the same time edited *The Philosophical Review* and *The School Review*. In January, 1899, he was nominated by President McKinley chairman of the U. S. Philippine commission, and given temporary leave of absence from Cornell. He is the author of *Kantian Ethics*, *Ethics of Evolution*, *The Ethical Import of Darwinism*, *Belief in God*, *Agnosticism and Religion*, and *The Genesis of the Critical Philosophy*.

Schuyler (*ski'ler*), **Philip John,** an American general, was born at Albany, N. Y., Nov. 22, 1733. He served in the French and Indian war, was a member of the colonial assembly from 1768, and of the continental congress of 1775, and one of the first four major-generals of the Revolutionary army. He was preparing to invade Canada as head of the northern department of New York, when his health obliged him to give up the command to General Montgomery, and in 1779 he resigned his office, though remaining one of Washington's most trusted advisers. He made treaties with the Six Nations, was state senator for thirteen years, and United States senator for two terms, and surveyor-general of the state from 1782. He was one of the leaders of the Federal party in New York, and helped to prepare the state code of laws. He died at Albany, Nov. 18, 1804. See *Life*, by Lossing; *Philip Schuyler and His Family*, by Schuyler.

Schuylkill (*sköl'kil*), a river of Pennsylvania, rising in the coal region near Pottsville, and flowing 130 miles southeast into the Delaware river at Philadelphia, to which it furnishes its water supply. Coal barges ascend the river by the help of dams and locks.

Schwatka (*shwot'kä*), **Frederick,** an American Arctic explorer, was born at Galena, Ill., Sept. 29, 1849, and died (by suicide) at Portland, Oregon, Nov. 2, 1892. In 1871, he graduated from West Point, receiving a commission as lieutenant of cavalry in the United States army, which he resigned in 1884. Early in his career he became interested in Arctic exploration and in the fate of Sir John Franklin and his party. In 1878, he obtained leave of absence and joined an expedition, on the *Eöthen*, for King William's Land. This search party returned two years after, having discovered and interred many of the skeletons of Franklin's crew, and solved, in some degree, the mystery of that explorer's fate, bringing home interesting relics at the same time of Franklin's outfit. On this expedition, the *Eöthen's* party made a sledge-journey of over 3,250 statute miles—the longest on record. Later on, Lieutenant Schwatka explored the course of the Yukon river, in Alaska, and in 1886 he commanded the New York *Times* Alaskan expedition and ascended Mt. St. Elias to a height of 7,200 feet. He also sought in Northern Mexico for remains of Aztec civilization. He published accounts of his explorations, among which are *'Along Alaska's Great River*, *A Nimrod of the North*, *The Children of the Cold*, *The Franklin Search*, etc. See Gilder's *Schwatka's Search*.

Sci'ence. To know a truth in its relations to other truths is to know it scientifically. For example, when one understands that the change of night and day depends upon the apparent daily motion of the sun, he has mastered a scientific truth which thinking-minds have known from time immemorial. By summing up every-day experiences like this, man has been led to the belief that natural events follow each other in an orderly and connected way. To investigate this orderly connection is the aim of all science. The method in use is called the scientific method, and is that of observation and experiment. In this way great laws are deduced, or thought to be deduced, for history shows that the scientific beliefs of one age are time and again overthrown by the scientific discoveries of a later age. Great principles which lie at the foundation of all science have, however, been certainly determined, and especially have great advances in scientific knowledge been made in the last century.

The different divisions of science have been grouped in different ways by Comte, Herbert Spencer, and others. The most general division is into physical sciences, which have to do with matter and force; biological sciences, which consider the laws of life; and psychical sciences, which deal with the phenomena of the mind. Religion, agriculture, politics, and art are as truly sciences as are geology and astronomy. But the word science is often used popularly to mean the physical sciences alone. See Jevons' *Principles of Science*.

Scil'ly Islands, a group of islands on the southwestern coast of England, 27 miles

southwest of Land's End. There are six large islands, and about 30 smaller ones, and many rocks and ledges. Tin is found in small quantities. Athelstan conquered the islands in 938, and put some monks on Tresco, where are still seen the ruins of their abbey. Queen Elizabeth leased the islands to Sir Francis Godolphin, in whose family they remained for 250 years. The star castle on St. Mary's island was built by him, and the village of Dolphin on Tresco owes its name to the family. In 1834, they were leased to Augustus John Smith, and in 1872 to his nephew. There are lighthouses on several of the islands, but wrecks were formerly common, one of the most noted being that of Sir Cloudesley Shovel's fleet in 1707, when 2,000 men were drowned. The principal industry of the islands is the cultivation of the narcissus and other lilies, 100 tons of flowers being shipped in a single spring. The mackerel fishing in May and June is extensive, a daily steamer carrying away a cargo of 100,000 fish. See *A Week in the Isles of Scilly*, by White.

Sciop'tican. See MAGIC LANTERN.

Scioto (*sī-ō'tō*), a river in southern Ohio. It rises in the northwestern part of the state, flowing east and south to the Ohio river, which it enters at Portsmouth. It is 300 miles long, and is a feeder of the Ohio and Erie canal.

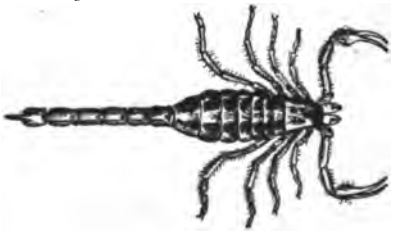
Scipio (*sip'i-o*), **Publius Cornelius,** called "Africanus Major," a Roman soldier, was born in 237 B. C. He saved his father's life at the battle of Ticinus (218) and was also in service at Cannæ. He was so popular that he was elected to the Roman office of "ædile" before he was of legal age, and was chosen a "general extraordinary" for Spain by acclamation, a choice which his victories in that country, which gave the whole state to the Romans, proved wise. He succeeded in having the war carried into Africa, thus compelling Hannibal to leave Italy, where he defeated him at Zama, Oct. 19, 202, thus ending the long struggle between Rome and Carthage. He was received in triumph at Rome, the title of Africanus given to him and the offer of the positions of consul and dictator for life, which he refused. With his brother Lucius he won the great victory of Magnesia over Antiochus, and when his brother was prosecuted for receiving bribes from Antiochus and condemned, he rescued him from prison. Later charges were brought against Scipio himself, which he did not deign to notice, but on the first day of his trial, told the story of his victories, and on the second day reminded the people that it was the anniversary of the battle of Zama, and a time to give thanks to the immortal gods. In the popular excitement that followed the prosecution was ended. His daughter was Cornelia, the mother of the Gracchi. He died at his country seat of Campania about 183 B.C.

Scip'io, Publius Cornelius, called "Africanus Minor," was born 185 B. C. He was the son of Lucius Æmilius Paulus, the conqueror of Macedon, but was adopted by Publius Scipio, a son of the great Scipio. He fought with his father at Macedon, went to Spain as military tribune, and in 149 B. C. laid siege to Carthage. He was elected consul in 147. In 146, he took Carthage by storm, and obeyed with sorrow the harsh order of the senate to level it with the ground, and plow over its site. As he gazed on the ruin, the thought of the possible destruction of Rome flashing over him, he quoted the words of the *Iliad:* "The day shall come when sacred Troy shall perish, and Priam and his people shall be slain." In 142 he was censor, in 139 an ambassador to Egypt and Asia, and in 134 he was re-elected consul. The contests in Spain tried the best skill of the Roman generals, until in 134 Scipio was sent to Spain, and after an eight months' siege of Numantia, destroyed the city. In the political troubles at Rome, Scipio made the reform party angry by interfering for the Latins whose lands were being seized, in the haste to carry out a new measure, and he was found dead in bed in 129 B. C., doubtless murdered by some member of the party.

Sclerenchyma (*skle-rn'ki-mȧ*) (in plants), a tissue whose cells have walls uniformly thickened. These cells are usually more or less elongated, and a common form is fibrous. Sclerenchyma is a mechanical supporting tissue and is generally developed wherever strength is needed. It is very commonly associated with the vessels, forming the so-called "fibers" of the fibrovascular bundles. It is also frequently developed in the cortex, either in strands or in bands.

Scone (*skōn*), a town in Scotland, two miles north of Perth, on the river Tay, celebrated as the place where the Scottish kings were crowned from 1153 to 1458. The "Stone of Destiny," on which the kings were seated, was carried off in 1296 by Edward I. See *History of Scone*, by Urquhart.

Scor'pion, the common name for any member of the natural order of jointed animals called *Scorpionida*. These animals are united



SCORPION.

into a class with the spiders. They have long slender bodies and resemble in a general way the small lobster. The head and thorax are joined into a single division, but

the long abdomen is plainly jointed. It is divided into two portions, a broad part of seven joints, and a more slender tail-like part with five joints. The latter is terminated by a sting, and is carried arched over the back of the animal. The thorax bears four pairs of walking legs. The most prominent appendages are the pedipalps, which extend forward and end in brood clams. Scorpions are restricted to warm countries. They range in length from two to eight inches. Small kinds are common in the southern portion of the United States. During the day they lie concealed under stones and in holes, but they are active at night. Their food is insects, spiders, and other small animals. They are able to inflict a severe wound with their sting, but it is rarely if ever fatal.

Scotland is one of the kingdoms forming the British empire, and is the northern part of Great Britain, surrounded by the ocean on all sides except on the south, where it touches England. It is 274 miles long and from 24 to 146 miles wide, including 30,902 square miles, which makes it about as large as the state of Indiana. The coast line of 3,000 miles is deeply indented, so that very few places are more than 40 miles from the sea, and there are 787 islands, mostly in the Hebrides, Orkney, and Shetland groups. The Solway Firth, the Liddel, and Tweed rivers, and the Cheviot hills separate Scotland from England. The rivers, flowing mostly to the sea, are not large, the Clyde of 106 miles being the longest. The Tweed, Forth, Tay, and Dee are well known, as are also the beautiful fresh-water lakes Loch Lomond, Loch Katrine, Loch Leven, etc. The division of the country into Highlands and Lowlands is rather a division of race than of country, for though the Highlands include the more mountainous parts of the country, they have rich, level tracts, while there is hardly any part of the Lowlands without mountains. The Highlands is that part of the north and northwest of Scotland where the Celtic language and customs still linger, and includes the Hebrides, but not the Orkneys and Shetlands, where the people are of Norwegian origin. There are nearly 200 mountain peaks in Scotland over 3,000 feet in height, the highest being Ben Nevis, 4,406 feet. The northern Highlands, the Grampians, and the Cheviot hills, with their beautiful glens and mountain lakes, make up the famous scenery of Scotland. The nearness of the ocean tempers the climate, so that the thermometer rarely falls to zero in winter, or rises above 80° in summer. The animals and plants resemble those of England. About half of the birds are waterbirds, and fish, especially shellfish, abound. The country is not well adapted to agriculture, because of its cool summers, late springs, and heavy rains, but it is carried on with great care and the use of the most improved methods; and in the wildest mountain regions sheep graze. The fisheries form an important industry, especially the salmon, herring, cod, and ling. The salmon is so abundant that before it was sent to England in large quantities, servants used to make a condition that they should not be fed upon it more than three times a week. The principal minerals are coal, iron, known in the United States as Scotch pig, lead, and granite, sandstone, and other fine building stones. The linen, cotton, and wool manufactures are large, and there are besides silk, hemp, hosiery, hats, leather, and soap factories, and large breweries and shipyards.

Scotland, since its union with England, sends 16 peers to the house of lords and elects 72 members to the house of commons. It has its own courts and its state religion, which is Presbyterian. Its common-school system, going back to 1695, made the Scottish people of the 18th century the best educated in Europe. There are four universities, Glasgow, Aberdeen, Edinburgh, and St. Andrews.

The early inhabitants of Scotland were the Picts, a collection of Celtic tribes, and the country was called by the Romans, Caledonia. The Scots were a tribe from Ireland, then called Scotia, who settled on the western coast of Caledonia, and the kingdom of the Picts and Scots seems to have been called Scotland first in the 10th century. There are 38 Pictish kings mentioned in early Scotch history. The Saxons settled in the lowlands in 449, and one of their leaders, Edwin, founded Edinburgh (Edwin's-burg). The introduction of Christianity into Scotland by Irish missionaries dates back to the 6th century. In the 9th century, the Scots became the leading power in the country, and the government was in the hands of their prince, Kenneth Macalpin. The first great battle of Scottish princes on English soil was fought in 937, between Constantine, their king, aided by the Danes, and the Saxon king, Athelstan. During the reign of Malcolm, the son of Constantine, Edmund, king of England, restored to that prince a part of the Cambrian kingdom, which Edmund had wrested from the Britons, and this grant was the pretext for the claim of homage from the Scottish rulers, made by the English kings for so many years. Malcolm II., Duncan, and Macbeth, the next three kings of Scotland, are well-known through Shakespeare's tragedy. Malcolm III. defeated the usurper Macbeth in 1057. His wife was Margaret, the sister of Edgar Atheling of England, and her influence and that of his own life in England led to the introduction of English customs; while the tyranny of William the Conqueror drove large numbers of the Saxons into Scotland. The three sons of Malcolm who succeeded him, Edgar, Alexander, and David, continued their father's policy; David was to Scotland what Arthur was to England. He established Norman, English, and French colonies, introduced a

system of written law, and placed the religion of the country on a new basis, providing for the support of the clergy, and the building of churches. His grandsons, Malcolm IV. and William the Lion, and Alexander II., the son of William, brings the list of Scottish kings to Alexander III., one of the ablest and best of their rulers. His sudden death, in 1286, ended the period of Scotland's prosperity that had lasted for 400 years. The struggle for the succession between Baliol and Bruce, and the ambition of Edward I. of England, who had conquered Wales, to add Scotland to his kingdom, brought in the series of conflicts under Wallace and Bruce, ending in the battle of Bannockburn.

Robert I. (Robert Bruce) was succeeded by his infant son David, and his grandson Robert, who, as Robert II., heads the list of the Stuart sovereigns of Scotland, which numbers fourteen; an unfortunate race, including Robert II., Robert III., who died of grief, with his elder son murdered, and his younger son an English captive; James I., for eighteen years a prisoner in England and finally murdered; James II., killed in battle; James III., murdered with his son in rebellion against him; James IV., killed at Flodden; James V., who died broken-hearted at the rout of Solway Moss; Mary, twice a widow, and twenty years a captive, beheaded at Fotheringay castle, and James VI. of Scotland and I. of England. The feuds of the powerful nobles of Scotland, and the struggles with England, kept the country in a state of turmoil. In 1503, James IV. married Margaret of England, which finally resulted in the union of the two kingdoms. Under James V., religious struggles added to the troubles of the country, and James VI. became king of England on the death of Elizabeth, in 1603.

The Scotch parliament met for the last time in 1706. The leading statesmen of both Scotland and England felt that nothing but a complete union of the two countries would bring about permanent peace, and though opposed by a majority of the people, the Scottish parliament passed the act of union Jan. 16, 1707. The union was unpopular in Scotland for many years, but with the evident prosperity of the country under the new arrangement, discontent gradually disappeared; though Scotland and England are still two countries, and a Scot abroad, if asked if he is an Englishman, will seldom answer "yes." The Gaelic language used in the west and north of Scotland is a Celtic dialect, while the Lowland Scotch is a form of the Saxon, being the same as the Northern English of Northumbria. The dialects are many, classed as Border Scotch, Central Scotch, and Northeastern Scotch. The chief cities of Scotland are Edinburgh, the capital, Glasgow, Dundee, Aberdeen, Leith, Paisley, and Greenock. Population 4,313,993. See BRUCE, MARY STUART, etc. See *Scotland under Early Kings*, by Robertson; *Scotland as It Was and as It Is*, by Argyll; *Scotland from the Earliest Century to the Present Time*, by Mackintosh.

Scot'tish Literature. See LITERATURE, ENGLISH.

Scott, David, a Scottish painter, was born at Edinburgh, in October, 1806. He was an apprentice of his father, who was an engraver, but turned his attention to painting, exhibiting his first picture in 1828. He studied at Rome, painting while there his *Vintager*, now in the national gallery. Among his best-known works are the illustrations of the *Ancient Mariner*, and *Pilgrim's Progress*, and the paintings, *Nimrod*, *The Traitor's Gate*, *Queen Elizabeth at the Theatre*, and *Vasco da Gama Encountering the Spirit of the Cape*. He died March 5, 1849. See *Memoir*, by his brother, W. B. Scott.

Scott, Sir Walter, the Scottish novelist, was born at Edinburgh, Aug. 15, 1771. He became lame as the result of a fever when an infant. At Edinburgh university, where he studied, he declined to learn Greek, which he regretted in his later years. He studied law, and as a lawyer's clerk superintending the removal of a family who had not paid their rent, he first entered the Highlands. His first publication in 1796 was a volume of rhymed versions of ballads by Bürger. The first two volumes of *The Border Minstrelsy*, for which he had been preparing himself by gathering legends and hunting up old ballads for nearly ten years, appeared in 1802. *The Lay of the Last Minstrel*, begun as a ballad, published in Edinburgh in 1805, made him very popular; *Marmion* followed in 1808, and in 1810 *The Lady of the Lake*. He was now offered the place of poet laureate, but declined in favor of Southey. His first novel, *Waverley*, was begun in 1805, but laid aside until 1814, when he wrote the last two volumes in three weeks. *Guy Mannering*, "the work of six weeks," and *The Antiquary* followed, all by the "author of *Waverley*," as Scott's authorship was not known. They were very popular, and in wonderfully quick succession followed *Rob Roy*, *Old Mortality*, *The Heart of Midlothian*, *Ivanhoe*, and the rest of the well-known stories. His purchase of Abbotsford and the sums spent on its improvement, and his generous hospitality and liberality, especially to poor writers, had used up his large receipts from his writings,

SIR WALTER SCOTT.

and the failure of both the firms that published his works, in one of which he had been a secret partner, all combined to place Scott heavily in debt. His friends offered help and his creditors a compromise, but he declined both, and bravely at the age of 55 undertook to pay off a debt of $700,000 by his pen. He wrote fourteen hours a day, producing among other works, his *Life of Bonaparte*, several series of his *Tales of a Grandfather*, from Scottish history, and *Woodstock*. At a public dinner in Edinburgh in 1826, he made himself known as the author of the *Waverley Novels*, which the public had already discovered, and he afterward furnished notes and prefaces for a new edition. But his excessive labors brought on symptoms of paralysis, and he sailed to Italy for rest, receiving everywhere the honors due to his literary fame. His failing strength warned him of the end, and he begged to be taken back to his beloved Tweed. He reached Abbotsford, where he died Sept. 21, 1832. In the last moments of consciousness he turned to the window for a last look at the river Tweed, then said, "To-night I shall know all." At his death over $500,000 of his debt had been paid, and soon after the copyrights of his novels brought in sufficient to pay the last dollar. His novels have been translated into almost every civilized language. He was buried at Dryburgh Abbey, and a Gothic temple was built to his memory at Edinburgh. See *Life*, by Lockhart, and *Journal*, by himself.

Scott, Winfield, an American general, was born at Petersburg, Va., June 13, 1786. He studied at William and Mary college, and

WINFIELD SCOTT.

first became a lawyer, but in 1808 entered the army as captain. In the War of 1812, he was sent to the Canadian border, where he fought at Queenston and at Lundy's Lane, being taken prisoner at Queenston, but was soon exchanged and was wounded in both the battles, having two horses shot under him at Lundy's Lane. He was made a major-general for his services, receiving also the thanks of congress. His services were helpful in preserving peace during the nullification troubles in South Carolina, where he commanded the Federal forces at Charleston harbor, and also in the disputes about the border of Maine in 1839. As commander-in-chief of the United States army, which office he held from 1841, he took command of the invasion of Mexico in 1847. He captured Vera Cruz, and defeated Santa Anna at Cerro Gordo, taking Jalapa and Puebla. The battles of Contreras and Churubusco might have been followed by the taking of the capital, but an effort was made to negotiate a treaty. The castle of Chapultepec was taken by storm, and Sept. 14, 1847, Scott's army marched into the city of Mexico, where he commanded until the treaty of peace was signed in February, 1848. He was a candidate for the presidency in 1852, but failed of election. At the beginning of the Civil war, he was in charge of the army, but soon yielded his position to younger and stronger men. He died at West Point, May 29, 1866. See *Life*, by Mansfield, and *Memoirs*, by himself.

Scran'ton, a city of Pennsylvania, on the Lackawanna river, 144 miles northwest of New York. It is a well-built city, with wide streets and many fine buildings, including a cathedral. Its prosperity is largely due to its situation in the anthracite coal region, which gives it an immense coal trade, and also a large business in mining supplies. There are also great iron and steel factories, making locomotives, boilers, machinery, tools, etc. It has a large foreign population, especially of Welsh miners. The city annually expends the sum of $383,759 on its public schools, which have a force of 337 teachers and an attendance of 15,906 pupils. Population 102,026.

Scream'er, a class of South American birds resembling most nearly ducks and geese. The horned screamer, found in Brazil and Guiana, is about as large as a turkey and blackish brown in color, with a long, slender horn on the head. It lives in swamps, eating the leaves and seeds of water plants. The crested screamer has no horn, but instead a bunch of tall feathers. The name is given because of its loud, harsh cry.

Screw, a simple mechanical device for transforming a motion of rotation into one of translation. An external, or ordinary, screw is made by cutting a spiral groove on the surface of a cylinder; an internal screw, generally called a "nut," is made by cutting a similar groove on the inside surface of a cylinder. The elevation of metal adjoining this groove is called the "thread" of the screw. When the nut is slipped over the screw and held so that it cannot rotate, and the screw is placed in bearings so that it cannot be translated, it is evident that for every turn of the screw the

nut must advance along the axis of the screw by a definite amount. The amount of this advance is called the "pitch" of the screw. The arrangement just mentioned forms the most accurate mechanical method for measuring small distances and for producing small displacements.

Ordinary screws are generally made by forcing a steel nut, called a "die," over a cylinder of metal. In like manner, nuts are made by forcing a conical screw, provided with sharp cutting edges, through a hollow cylinder of metal. This conical screw is called a "tap." Higher grades of screws are made by placing a cylinder between the centers of a lathe and then moving the cutting tool along the lathe bed on a carriage which is itself operated by another screw.

With elaborate precautions, Professor Rowland succeeded in this way in making a more perfect screw than had ever been made before, one which, when finally corrected, moved the ruling point of a dividing engine with such accuracy that no single ruling was in error by as much as $\frac{1}{100000}$ of an inch. "Wood-screws," so called, are metal cones, upon which a thread has been cut, and upon which a slotted head has been made. They have pointed ends for starting into wood, where they cut their own nuts and act rather as *clamps* than *screws*.

See article SCREW, in *Encyclopædia Britannica*, written by Rowland. See also article ROWLAND, in this work, and Rankine's *Machinery and Millwork*.

Screw-Propel'ler, a wheel with two or more radial blades in the form of a helix or spiral, used to propel a vessel. In modern ocean steamers, there are generally two propellers, one on each side of the keel. The action of the propeller is similar to that of a screw revolving in a fixed nut, the water being more or less fixed as regards the revolving propeller. The screw-propeller was suggested by several inventors about 1800, and in 1801 John Stevens, of Hoboken, N. J., made a successful experimental boat with a screw propeller. But it was not until between 1835 and 1840 that it began to come into general use. Its practical use was then demonstrated by F. P. Smith in England and by Capt. John Ericsson, first in England and later in the United States. Ericsson is generally given the credit of having made the first successful application of the screw-propeller to steam navigation. At present it is the only method of propulsion used on large steam vessels. The design of the shape and size of the propeller depends on conditions more or less peculiar to each vessel, and requires not only calculations but often experiments before the best shape is found for a given boat. Propellers are generally made of gun metal. The dimensions of the propellers and shafts on the transatlantic steamers are very large. For the *Celtic*, a "White Star" steamer of 14,259 tons displacement, the two propellers have each a diameter of 20 feet, and are carried on steel shafts of 19½ inches diameter.

Scribe, a name used among the Jews originally to indicate a military officer, whose business was recruiting soldiers and levying taxes, etc. Later the name was given to those who copied the books of the law, and as those who copied the law became its best expounders, the word "scribe" had come to mean, in the time of Christ, an expounder of the law, or a learned man. They were found all over Palestine and were reverenced by the people as public teachers and lawyers. Some of them were members of the Sanhedrim, or court, and some of them had public class rooms, where their disciples sat at their feet. Those who did not fill these higher places in the nation were engaged in copying the books of the law and of the prophets and in writing contracts, letters of divorce, etc. See *History of the Jewish People in the Time of Christ*.

Scud'der, Horace Elisha, American man of letters, was born at Boston, Mass., Oct. 16, 1838, and graduated at Williams college. After teaching school for three years in New York city, he took to the writing of stories for youth, and edited a magazine in their interest. From 1890 to 1898 he edited the *Atlantic Monthly* and became a resident of Cambridge, Mass. Here he assiduously pursued a literary life, writing, besides his successful series of *The Bodley Books* and a brief *History of the United States*, a monograph of *Noah Webster*, an historical biography of *Washington*, a collection of essays and criticisms, entitled *Men and Letters*, etc. He is the editor also of the series of volumes of the *American Commonwealths*, and author jointly with Mrs. Taylor of the *Life and Letters of Bayard Taylor*. He was one of the writers, moreover, of Bryant & Gay's *History of the United States*, and of Justin Winsor's *Memorial History of Boston*. Died 1902.

Sculpture (*skŭlp'tūr*), from a Latin word meaning to cut out or carve, is the art of representing the form of an object in a solid substance. When a figure is only partly raised from a background it is called "relief," and has different names according to the degree in which it is raised, as bas-relief, meaning low relief. Wood, marble, granite, bronze, gold, and ivory are some of the materials used in sculpture; anything that can be cut, or moulded into shape, being made use of. The Greeks and Romans worked largely in marble, especially the pure white marble brought from the island of Paros, called Parian. The art is an ancient one, beginning with the use of memorial stones and the making of images of the gods. The Egyptians are among the earliest nations to use sculpture in their religion, their temples being covered with reliefs, while innumerable

statues of gods stood upon their plains. The Sphinx was probably sculptured about 4000 B. C. The specimens of Assyrian sculpture found belong to the 9th and 8th centuries B. C. and are largely bas-reliefs, and made on a large scale, and of curious forms, such as the colossal winged bulls, with human heads, that guarded their palaces. The first monument of Greek art which has come down to the present time, is the marble statues on the temple of Athena at Ægina, by an unknown author. They are now at Munich. Phidias, the greatest of Greek sculptors, and of the world, known by his great work, the Parthenon, was followed by Praxiteles, Scopas, Lysippus, and such works as the *Venus of Milo*, *Apollo Belvedere*, *Laocoön*, etc. The best artists of Rome were Greeks, and her treasures of art were largely brought from the plundered cities of Greece. For several centuries the art of sculpture was almost lost, until the 14th and 15th centuries, when Ghiberti made his wonderful gates at Florence, and Donatello his statues of St. Mark and St. George, and Michael Angelo towered above all others. The 17th century witnessed only a falling back in the art of sculpture, with no immortal names among the artists; while the names of Houdon, Canova, Chantrey, Gibson, Thorwaldsen, and Rude, among others, adorn the 18th century. The art has many followers in the present century, such as Alfred Stevens, of England, with his magnificent monument to the duke of Wellington, and Barye Rodin, and many others in France, and Powers, Crawford, Greenough, and Rogers in the United States. See *History of Sculpture*, by Lübke; *History of Greek Sculpture*, by Murray.

Scutari (*skō-tä'rē*), a town in Turkey, on the eastern shore of the Bosporus, opposite Constantinople, of which it is a suburb. It is built on the slopes of a hill, and has several handsome mosques, bazaars, a dervish college, and factories of cotton, silk, and leather goods. It is famed for its large cemeteries adorned with great cypress trees, where many of the Turks from the city are buried, because it is the sacred soil of Asia. During the Crimean war the barracks and hospital of the English troops were at Scutari, and formed the scene of Florence Nightingale's labors. A marble obelisk marks the site of the English burial place. Population from 40,000 to 60,000.

Scylla and Charybdis (*sil'lä and ka-rib'dis*), in Greek legend, were two sea monsters who dwelt on opposite sides of a narrow sea strait. Scylla had twelve feet, six necks, and six mouths, with three rows of teeth in each, and barked like a dog. Charybdis lived on a cliff under a large fig tree, and three times a day she sucked up the waters of the sea, and three times a day threw them back again. Ulysses passed safely between the monsters, but Scylla snatched away six of his sailors. The names are now applied to a couple of rapids in the straits of Messina near Italy. From the difficulty of passing between them without falling into one or the other, rises the proverb, "To shun Charybdis and fall into Scylla."

Scythians (*sith'i-ans*), an ancient race of Asia. The name is given either to the Scythians proper, the Scolots, or to all the wandering tribes who lived on the steppes from Hungary to Turkestan. The Scythians proper were a wandering people, living in the treeless plains between the Danube and the Volga. They lived in tent-covered wagons, kept herds of horses, cattle, and sheep, fought with bows and arrows on horseback, made drinking cups of the skulls of their enemies, and worshiped without images gods like those of the Aryan Greeks. They seem to have learned some of the arts of civilized life from the Greek colonies, and a Scythian king went to Athens to study under Solon. In the 7th century they invaded Media, occupying it ten years, until Cyaxares made all their chiefs drunk at a banquet and slew them. The Scythians of Europe were nearly exterminated by the Sarmatians in the 4th century. The Scythians of Asia overran Parthia (Persia) about 128 B. C. and founded a kingdom in the eastern part of the empire, so that that part of Asia was called Indo-Scythia. In the century before and the century after Christ, they invaded northern India, where they held possession for four or five centuries. See *The Greek World under Roman Sway*, by Mahaffy.

Sea. The waters of the sea cover about 143,259,300 square miles, or about five-sevenths of the earth's surface. The ocean basins are filled with sea water up to within about 2,250 feet of the general level of the continents, the average depth of the water in these basins being 12,480 feet. Were the solid crust of the earth to be reduced to a level, the surface of the earth would then be covered by a universal ocean with a depth of about two miles. The greatest sea depth recorded is 4,655 fathoms in the North Pacific, east of Japan. The bulk of water in the whole ocean is stated to be 323,800,000 cubic miles. The temperature of the surface waters varies from 28° F. in the polar regions to 85° or 86° F. in equatorial regions. The bottom waters vary from 32.7° F. to 36.8° F. At a depth of a little over half a mile the water of the tropics has generally a temperature below 40° F. The circulation of oceanic waters is kept up by the action of the prevailing winds on the surface layers. In the southern hemisphere the warm water of the tropics is driven to the south along the eastern coasts of South America, Africa, and Australia, till, between 50° and 55° latitude, it sinks on being cooled, and spreads slowly over the ocean floor to the north and south. A similar circulation takes place in the north; the cold water which occupies the deeper parts of the Arctic basin, is largely made up

of the dense Gulf stream water which sinks to the bottom on being cooled in the Norwegian sea. The water evaporated from the sea surface is borne to the land, and condensed on the mountain slopes. Over 6,500 cubic miles of this water is yearly sent back to the sea by rivers, carrying along with it salts and earthy matters; in this way the ocean has in all probability become salt in the course of ages. The saltest waters are found where evaporation is the greatest, for example in the Red sea, Mediterranean, and trade wind regions of the ocean basins. Owing to the constant circulation in the ocean, oxygen and other gases of the air are carried down to the greatest depths; thus animals and plants may flourish throughout the whole extent of the ocean. Water is but slightly compressible, and almost any substance which will fall to the bottom of a tumbler of water will in time fall to the bottom of the ocean. Still the pressure amounts to four or five tons per square inch; hence in an ocean with a depth of five miles, were the action of gravity suddenly to stop, the ocean waters would rise 500 feet above their present level by expansion.

Pure sea water is a light shade of blue; but it is sometimes a shade of green or brown, owing to foreign matter or plants and animals floating in it. Some form of life is scattered throughout the whole ocean. A trawl at a depth of over two miles, brought up 200 specimens of living animals; a trawl in about three miles' depth yielded 50 specimens; and fishes and animals have been found at over four miles depth. The term "Beuthos," is now used for all animals and plants which live attached to, or creep over the bottom of the ocean, "Plankton" being the term for all plants and animals which live in, and are carried along by the currents of the ocean. Life is most abundant in the surface waters down to about 100 fathoms, is less abundant in the intermediate regions, and becomes more plentiful within a few hundred fathoms of the bottom. The shells and skeletons of animals and fishes fall to the bottom after death and make up a large part of the sea deposits in many regions, especially in the deeper parts of the ocean. Besides these "pelagic" deposits, there are others, mainly made up of the débris from the solid land of the globe, laid down in greater or lesser nearness to the shores of continents and islands, which are called "terriginous."

Sea Lion. See SEAL.

Sea Ur'chin, a very common sea animal grouped with the *Echinoderms*. The common sea urchin has a globular shell or test, composed of carbonate of lime, and made of six-sided plates nicely fitted together. The shell is covered with spines, which vary in length and size according to the variety of the animal. Five rows of the plates composing the shell are perforated by openings for the tube-feet, and five rows are without such openings. The animals move mainly by tube-feet, but the spines are also movable and aid in locomotion. The mouth, with a complicated masticating apparatus, is on the under side. They feed on seaweeds and organic matter found in the mud. Some forms are flattened and called sand cakes. For illustration, see ECHINODENNATA. See also SAND DOLLAR.

Seal, a carnivorous animal fitted for a life in the water. The animal famous for yielding the valuable fur, called seal skin, is not

FUR SEAL.

a true seal, but a kind of sea lion with ears and more flexible limbs. The true seals have no external ears and their hind limbs are closely united together, being useless on the land, but very effective in the water. The hind limbs of the sea lions are separated and used by the animal when on land. All kinds of seals come on the land or on ice in great numbers during the breeding season. The true seals vary from four to eight feet in length. Their fur is stiff and they lack the woolly under fur of the fur seals. They occur on both sides of the Atlantic. The common harbor seal is found on British coasts and

GREENLAND SEAL.

on those of Europe and North America. It is four or five feet long, usually yellowish gray, with darker spots. The Greenland seals are larger; they congregate on shore in immense numbers for breeding. All true seals are awkward on land, and move by means of the muscles of the trunk, assisted a little by the fore limbs. The hind limbs are entirely passive. A large number (390,174, in 1892) are killed annually for their hides and oil.

Seals feed mainly on fish, but also eat crustacea and mollusks. The harbor seals are sometimes destructive to salmon. The eared-seals, sea lions, or sea bears, vary greatly in size. The larger ones reach a length of about ten feet. Their hind limbs are flexible and they make considerable journeys inland, but return to the water for food. To this group belongs the fur seal of the north Pacific. They are of moderate size, a full-grown male being about six feet and a female about four feet in length. These animals breed on the Pribylofs, the Commander, and the Robben islands of the North Pacific and Bering sea. Since 1835, they have been in a measure protected by law. The males three years old—at which age their fur is finest—are taken for their skins, together with unusually large ones two years old, and small ones four years old. From 1871 to 1889, inclusive, about 100,000 animals were taken annually, but they began to show a decline in 1885, and, in 1890, only 21,000 skins were secured. In 1895 and 1896, the number was reduced to 16,000 and 15,000 respectively. Controversies in reference to the fur seal fisheries arose between the United States, England, and Russia. The questions were referred to arbitrators who met in Paris in 1893. In 1896, the United States government and Great Britain each appointed a commission to study the life of the seals and the causes for their decline in numbers. The members of the United States seal commission reached the conclusion that the decline in the herds is due to killing females in the open sea, where the sex cannot be readily distinguished. This form of capture should be abandoned, the hunt for skins should be confined to killing on the land, and restricted to the three-year-old males. See Allen's *Fur Seal and Other Fisheries of Alaska* (Washington 1889); Jordan's *Report of the Fur Seal Investigations* (Washington, 1898).

Sealed Orders are orders which are delivered to the commanding officer of a ship or squadron, sealed up and only to be opened when at sea. The commanding officer of a ship or squadron is sent to sea under sealed orders when sailing on any secret service, to prevent the destination and object of the expedition from becoming known. The commander, equally with all under him, is ignorant of where he is to sail or what he is to do until the seal is broken.

Seal'ing Wax. Before ordinary sealing wax was known in Europe, colored beeswax was used for sealing letters and documents. Sealing wax was probably first made in India or China. The best red sealing wax is made of shellac, Venice turpentine, and vermilion, to which is often added magnesia, chalk, or gypsum. In parcel wax, the main ingredient is common resin.

Seasons (*sē'z'nz*). The motions of the earth on which the seasons depend are explained in the article EARTH. The chief cause of the greater heat of summer and cold of winter is that the sun's rays fall more obliquely on the earth's surface in the latter season than in the former. Another cause is the greater length of the day in summer and of the night in winter. In the tropics, the sun's rays are always so nearly direct that no one part of the year is sensibly colder than another. But the zone of calms in which the rainfall is almost continuous, moves northward with the sun in the northern summer and southward in the southern summer. As the wet zone follows the sun, the regions it crosses have wet and dry seasons. In the Arctic and Antarctic regions spring and fall are very short, the year dividing itself simply into a long winter and a short summer. In temperate regions the year is naturally divided into spring, summer, fall, and winter. The almanacs assume that spring begins at the vernal equinox, March 20; summer at the summer solstice, June 21; fall at the autumnal equinox, and winter at the winter solstice. However, the greatest heat is reached sometime after the summer solstice, the time when the sun's rays are most nearly vertical and the day is longest. In like manner, the greatest cold of winter comes after the winter solstice, the time when the day is shortest and the sun's rays most oblique. The reason in the former case is that as summer comes on, the earth itself becomes more heated; in the latter, that it keeps a part of the heat which it had got in summer, just as the warmest part of the day is a little after midday, and the coldest part of the night is toward morning.

Seattle (*sē-ăt'l*), the largest city of the state of Washington, is located on Elliott bay, an arm of Puget sound, 18 miles north of Tacoma. It was founded in 1852 and was named in honor of Seattle, a noted Indian chief. The phenomenal growth of the city in recent years is shown in the fact that from a population of only 3,533 in 1880, it advanced to 80,671 in 1900. It is the center of a rich agricultural and mining region, there being important coal fields and immense deposits of iron ore within 40 miles of the city. The lumber trade has been a large factor in the growth of the city. The industries include sawmills, sash and door factories, carriage works, brickyards, machine shops, tanneries, breweries, etc. The development of gold mining in the Alaska region has of late years stimulated the growth of Seattle, there being regular lines of steamers to Alaskan ports, as also to San Francisco and to the Orient. From the east it is reached by the Northern Pacific and Great Northern railways. Here are located the Washington State university, Seattle Female college, and College of the Immaculate Conception. The public schools are of high excellence, the teaching force numbering 250, with 11,000 pupils in attendance. The cost of maintaining the schools is $290,962.

Sea'weeds. See ALGÆ.

Sebastian (*se-bast'yan*), **St.,** a martyr of the early church, was a native of Narbonne. Under Diocletian he became a captain of the prætorian guard and secretly a Christian. It coming to the ears of Diocletian how Sebastian encouraged those who were being led out to death for being Christians, the emperor had his captain tied to a stake and shot by archers. But they did not wholly kill him; a pious woman named Irene took him away and tended his wounds. As soon as he recovered, Sebastian boldly faced the tyrant and upbraided him for his cruelty. Diocletian then ordered him to be beaten to death with rods (about 288 A. D.). His first martyrdom — a young and handsome soldier bristling with arrows — was a favorite subject for the Italian religious painters, such as Mantegna, Veronese, and Domenichino.

SECRETARY BIRD.

Sebastopol (*sĕb'as'tō'pol*), a Russian seaport and fortress, is near the southwest end of the Crimea, on the southern side of one of the finest harbors in the world. The place is celebrated for its long siege by the French, Turks, and English in the Crimean war of 1854–55. The town and harbor were defended by forts of immense strength, built of limestone faced with granite, on which artillery made little impression. On the land side the earthworks and fortifications raised by General Todleben kept the armies of France and England at bay for eleven months. But the capture of the Malakoff and Redan works at length forced the Russians to evacuate the lines. The town was mined and the docks and forts blown up by the allies. The fortifications and docks have since been rebuilt. The imports of Sebastopol are mainly cotton, and coal; the exports, grain. The town was founded in 1783 under orders of the Empress Catharine II. Population 39,000, not counting a garrison of 12,000. See Leo Tolstoi's *Sebastopol.*

Sec'retary Bird, a large bird of South Africa, receiving its name from the arrangement of a number of black and gray quills over the ear, in the position of a clerk's pen. It belongs with the birds of prey, but is unlike the others and stands alone in that group. From its habit of eating snakes, it has also received the name of the serpent eater. The bird is about four feet long from bill to tip of tail, which is about two feet long. The legs and neck are both long, and the body makes up only a small part of the bird. The general color of the plumage is clear gray. They are shy in their native haunts, but have been domesticated by Cape Colony farmers. Their favorite food seems to be frogs and toads, but lizards and many snakes are devoured.

Secre'tion (in plants), in its broadest sense, the process by which substances are separated from the protoplasm; also the substances so separated. In this sense, the cell-wall and starch grains are secretions, since they are formed by the protoplasm and separated from it. The term is usually applied, however, to waste products (sometimes distinguished as excretions) or to products which have some special function, *e. g.*, enzymes (which see) and nectar. The number and variety of secretions are very great. Some of them are formed in a special cell or group of cells, constituting a gland, which may be on the surface (*e. g.*, in geranium leaves), or may adjoin an internal space into which the secretion is poured (*e. g.*, resin glands of pines). In other cases the secretion accumulates in the gland cells, which finally die, leaving a mass of the secretion occupying their room, *e. g.*, in orange rind. The methods by which the secretion is put forth from a cell are not known.

Seda'lia, a large central city of Missouri, is situated in a fine farming district and is a nest of factories. There are car works, machine shops, woolen mills, manufactories of agricultural implements, wagons, furniture, etc. It has fine railroad facilities, several roads converging here. It was founded in 1860, and has now a population of 15,231.

Sedan (*se-dŏn'*), a town and frontier fortress of France, stands on the Meuse, 64 miles northeast of Rheims. The citadel surren-

dered to the Germans in 1815; but Sedan is chiefly noted for the surrender, Sept. 2, 1870, of Napoleon III. and an army of 86,000 men to the Germans, in the Franco-Prussian war. The Germans, under the command of King William of Prussia, began the battle of Sedan September 1. By manœuvers and hard fighting, the French under Marshal MacMahon were driven from all sides to the fortress, where, defeated, surrounded, and without provisions, they were forced to surrender. The emperor was sent a prisoner to Wilhelmshöhe, and two days later Gambetta proclaimed the republic at Paris. Colbert founded at Sedan cloth mills, which now employ 10,000 men. Its Protestant Theological seminary was famous in the days of the Huguenots. Sedan chairs were named from this town, where they are said to have been invented. Population 24,000.

Sedge, the name of a family of plants, one class of which contains over two hundred kinds in North America. They are mostly found in swamps and other wet places, forming often thick tufts. The stems are solid and triangular. Sedges are most common in cold countries. They differ in some important respects from grasses, especially in being worthless as pasture or food plants.

Sedg'wick, Catherine Maria, American novelist and writer, was born at Stockbridge, Mass., Dec. 28, 1789, and died near Roxbury, Mass., July 31, 1867. She was the daughter of Theodore Sedgwick (1747–1813), the Federalist politician and jurist. She is herself noted as one of the earliest of American women of letters, a contributor to the *Annuals*, in vogue early in the literary history of the United States, and a voluminous and entertaining writer of moral tales and miscellanies. Her chief works embrace: *A New England Tale*, published anonymously in 1822; *Redwood* (1824), which was reprinted in England and appeared also in three or four European translations; *Hope Leslie* (1827); *Clarence* (1830); *Linwoods* (1835); *Letters from Abroad to Kindred at Home* (1841); *Historical Sketches of Old Painters; Live and Let Live; The Poor Rich Man and the Rich Poor Man; Morals of Manners; Means and Ends, or Self-Training; Letters to My Pupils; Wilton Harvey, and other Tales; Facts and Fancies; Married or Single*, etc.

Sedg'wick, John (Major-general), was born at Cornwall, Conn., Sept. 13, 1813. A West Point graduate, he served in Florida as second-lieutenant when the Cherokees were removed. He also served through the Mexican war, gaining promotion at the battles of Contreras, Churubusco, and Chapultepec. His record in the Civil war was brilliant. By the spring of 1862, Sedgwick was in command of a division, and in July of that year was made major-general of volunteers. Also in 1862 he was twice wounded, at Glendale and at Antietam. As commander of the 6th, or Sedgwick's corps, as it was called, he made a forced march of 35 miles to Gettysburg, and commanded there the left wing in the battle of July 2 and 3, 1863. Three days after the battle of the Wilderness, May 5 and 6, 1864, in which he had taken part, he was shot by a sharpshooter while ordering a battery to be brought into position. See *Address on General Sedgwick*, by MacMahon.

Seebeck (*sā'bĕk*), **Thomas Johann,** a German physicist, born April 9, 1770, at Reval, died Dec. 10, 1831, at Berlin. Lived as a private gentleman in Jena, Bayreuth, Nürnberg, and Berlin. Seebeck will be remembered principally for his very important discovery of thermo-electric currents, sometimes called the "Seebeck effect." This is the converse of the "Peltier effect." (See ELECTRICITY and PELTIER.) For an excellent account of these two "effects," see J. J. Thompson's *Elements of Electricity and Magnetism*, ch. 14.

Seed Disper'sal. See SEEDS.

Seed-plants. The common name of Spermatophytes, which see.

Seeds. In general a seed is a transformed ovule, and an ovule is a megasporangium (which see). The transformation is connected with the process of fertilization. The most apparent effect is the development of the hard coat or testa, which has to do with the protection of the delicate structures within. This testa is formed usually in connection with the integument of the ovule. Within the seed coat the essential thing is the embryo (which see). Around the embryo there may be deposited more or less endosperm (which see), and outside of the endosperm, in some seeds, there is the perisperm (which see). A seed is well devised for carrying a plant through an unfavorable season of drouth or cold. The length of time a seed may retain its vitality and be made to germinate is known only in the most general way. The old story of the germination of wheat derived from mummies in Egypt was contradicted almost as soon as it was started, but the contradiction has never yet overtaken the original statement. That seeds may endure for several, and often many years, and then be made to germinate is well attested, but the data are very uncertain. Seeds must be carried out of reach of rivalry with the parent plant and with each other. Various agencies have been used to effect this dispersal: (1) *Currents of air.*—The wind transports numerous seeds, which have been prepared for this agency in a variety of ways. Some have tufts of hair, others plumes, others wings. Often it is the fruit rather than the seed which bears the tuft of hairs (as thistle) or the wings (as maple), but the result is the same. (2) *Currents of water.*—Many seeds may be carried long distances by water and still be able to germinate. The

banks and flood-plains of streams are constantly receiving seeds from the regions toward the headwaters, and the more extensive the area drained by a stream the more varied is the collection of seeds on its flood-plain. The oceanic currents probably carry seeds the greatest distances, transporting them from continents to islands, and even from continent to continent. By experiment, Darwin found that numerous seeds could be soaked in sea water long enough to be carried over 1,000 miles by an oceanic current, without losing the power of germination. (3) *Animals.* —Many seeds and fruits develop grappling appendages of various kinds, by means of which they adhere to animals brushing past, as the tickseed, Spanish needle, etc. The migrating birds, especially those which visit marshy shores, are great carriers of seeds which are imbedded in the mud adhering to their feet. Fruit-eating birds also transport seeds, which may pass through the alimentary tract without losing the power of germination. (4) *Explosive fruits.*— In some cases fruits have the power of forcibly discharging their seeds, as the violet, witch hazel, touch-me-not, etc. This method is interesting, but not so effective as the others, since the distance traversed is necessarily very limited.

JOHN M. COULTER.

Seeley (*sē'li*), Sir **John Robert,** an English historian, born in 1834 and died in 1895, was the author of several notable books, historical and religious. He held a professorship at University college, London, and in 1869 was appointed professor of modern history at the University of Cambridge. His writings embrace a *Short History of Napoleon I., Lectures and Essays, Life and Times of Stein, The Expansion of England, Natural Religion,* and his most celebrated work, *Ecce Homo, a Survey of the Life and Work of Jesus Christ.*

Seidl (*zīdl*), **Anton H.,** an Austrian musical conductor, was born at Budapesth, Hungary, May 7, 1850, and died at New York, March 28, 1898. After studying at Leipsic under Richter, and at Bayreuth under Wagner, he became conductor of the Leipsic Opera house, and in 1882 made a tour of Europe as conductor of Neumann's Nibelungen Opera troupe. In 1883, he was appointed conductor of the Opera house at Bremen, and two years later came to the United States, where he was received with favor in New York and other cities, as leader of German operas, and as successor to Theodore Thomas in conducting the concerts of the New York Philharmonic society. He was the notable exponent, for many years in this country, of Wagner's music.

Seine (*sān*), one of the four chief rivers of France, rises northwest of Dijon, and flows northwestward, with many windings, past Fontainebleau, Melun, Paris, St. Denis, St. Germain, and Rouen, for 482 miles, falling into the English channel at an inlet where stands the ports of Harfleur and Havre. It is navigable 350 miles from its mouth, or to Marcilly, and the improvement of the upper Seine as a canal is one of the schemes proposed to join Paris to the Atlantic. Its main branches are the Aube, Marne, Oise, Yonne, Loing, Essonne, and Eure; and canals join it to the Somme, Scheldt, Meuse, Rhine, Sâone, and Loire. Deep dredging from Rouen, through the inlet at its mouth, has made that city a seaport, and has reclaimed 28,000 acres of land. The situation of Paris on the Seine has made this, like the Hudson and the Thames, one of the famous rivers of the world. See Vernon-Harcourt's *The River Seine.*

Seismometer (*sīs-mŏm'ē-ter*), an instrument which is used to measure the amount and direction of displacement at any point on the earth's surface during an earthquake. The name is also applied to those devices by which the slow and gradual tilting of the earth's surface is indicated.

For the first of these two purposes the one thing essential is to place a body in neutral equilibrium and without friction. To realize these two conditions perfectly is of course impossible. But they can be very nearly approximated. Thus an open gate, with a heavy mass at its outer end, and rotating about a strictly vertical axis, with very minute friction, would fairly represent a seismometer. Three instruments of this kind, one free to move east-and-west, one free to move north-and-south, and one free to move in a vertical direction, will give the three components of any motion produced by an earthquake; and by compounding these three motions we can obtain the original motion. In the modern instruments, as perfected by Prof. John Milne, these records are automatically photographed.

Seismometers which are employed to measure the tilting of the earth's crust, generally use a beam of light which has been reflected, part of it from a mirror rigidly attached to the earth, and part of it from a surface of mercury, which remains horizontal whether the earth's crust is tilted or not. The variation in angle between these two beams measures the tilting of the earth. See Milne's *Earthquakes* in the "International Scientific" series, and Darwin's *Tides,* a series of popular lectures given before the Lowell institute in Boston, in which earth-tiltings are treated.

Seja'nus. See TIBERIUS.

Selaginella (*sĕl'ă-jĭ-nĕl'lă*), the genus of plants to which the "little club mosses" belong. See LYCOPODIALES.

Selenium (*sē-lē'ni-ŭm*), is a very rare element which exists in two forms. In the glassy form at ordinary temperatures, it is a solid of a dark brown color, and a non-conductor of electricity. When it is slowly cooled from its

melted condition it does not appear vitreous or glassy, but crystalline, of a dull leaden color, and at ordinary temperatures is a conductor of electricity. It is very sensitive to light, and its electrical resistance is much less in the light than in the dark. This property led to the discovery of the photophone in 1880. Selenium is found chiefly in combination with lead, silver, copper or iron; but it has also been found in sulphur and certain iron sulphides. Selenium was discovered, in 1817, by Berzelius in the waste of a sulphuric acid factory.

Seleucia (*selū-si-ă*), the name of several early cities: —

SELEUCIA PIERIA (*pi-ē'ri-ă*), founded by Seleucus Nicator, near the mouth of the Orontes in Syria, was the seaport of Antioch. It was a city of importance during the wars between the Seleucidæ and the Ptolemies for the possession of Syria. A remarkable tunnel, 1,088 yards long, dug out of the solid rock, the only connection between the city and the sea, and the ruins of its threefold line of walls, fortress, temple, amphitheatre, etc., speak of its former splendor.

SELEUCIA-ON-THE-TIGRIS was built by Seleucus Nicator, 40 miles northeast of Babylon, as the successor of that capital, which was despoiled to furnish it with building material. It grew fast and at one time had a population of 600,000. It was partly burned by Trajan and razed to the ground by Avidius Cassius in 162 A. D.— in the reign of Marcus Aurelius and Lucius Verus.

Seleucidæ (*se-lū'si-dē*), the royal house to whom fell Syria, a large part of Asia Minor and Persia, Bactria, and the other eastern provinces of Alexander the Great. Seleucus Nicator was driven to Egypt by Antigonus. The date of his return to Babylon, 312 B. C., was the beginning of the Seleucian empire. Suriana, Media, and the provinces as far as the Oxus and the Indus, fell into his hands. Joining the confederacy headed by Ptolemy, he gained Syria, and later all Asia Minor fell to his share on the defeat of Antigonus by the allies. Planting Greek colonies, founding many cities — some of which, as Seleucia-on-the-Tigris and Antioch, became among the largest and richest in the world — were some of his plans to create a great empire. Seleucus was murdered by one of his officers in 280 B. C. Antiochus II. allowed the great Parthian kingdom to rise in the east. The two ablest of Seleucus I.'s successors were Antiochus III., the first great eastern king to come into collision with the Romans, and Antiochus IV., whose cruelties would have perhaps succeeded in supplanting the Jewish religion by the Greek worship, had it not been for the patriotic resistance of the Maccabees. Antiochus died a raving lunatic. In derision, his subjects changed his surname, Epiphanes, "the Illustrious," into Epimanes, "the Madman." Syria, the last Seleucian possession, was conquered by Ptolemy in 65 B. C.

Self-pollina'tion (in plants), the transfer of pollen from a stamen to the stigma of the same flower. The same as "close-pollination." See POLLINATION.

Se'lim I., sultan of Turkey, was born in 1467, dethroned his father, Bajazet II., by the aid of the Janizaries, in 1512, and had his father, brothers, and nephews put to death. In 1514, after massacring 40,000 Shiites, he declared war against Persia, and defeated Shah Ismail near Tabriz. Three years later, he wrested Egypt from the Mamelukes, and annexed Syria. He also forced the caliph of Cairo to yield to him the headship of the Mohammedan world, and the standard of the prophet. The sacred cities, Mecca and Medina, also fell into his hands. This able yet savage ruler, however, improved the condition of the people he had conquered, kept the Janizaries in order, and was a lover of literature. He died in 1520.

Seljuks (*sĕl-jŏks'*), a division of the Ghuzz confederacy of Turkish tribes, who were settled on the Jaxartes and beyond the Oxus in the 11th century, when they became Mohammedans. Togrul Beg, grandson of Seljuk, founder of the dynasty, crippled the empire of Ghazni (1040), conquered Persia, and ten years later, Bagdad. Togrul's nephew and successor, Alp-Arslan, wrested Syria and Palestine from the caliph of Egypt, and in 1071 captured Diogenes, the Byzantine emperor. Diogenes' ransom was the best part of Asia Minor. The grand-vizier of the next reign was the able Nizam-ul-Mulk, a schoolmate of Omar Khayyam, the poet, and of Hassan ibn Sabbah, the founder of the famous secret order of the Assassins. The empire, at the close of this reign (1092), began to break up into smaller kingdoms. Even before this, strong chieftains like Saladin had been really independent. It was the Seljuk provinces of Asia Minor and Syria that bore the brunt of the crusades. Iconium was the capital of Rum, the Seljuk name for Asia Minor. This province, or rather kingdom, became very powerful under Kaikawus (1211–34), who ruled also over parts of Mesopotamia and Persia. During his son's reign the orders of dervishes arose, and the Mongols began to gain the power which they wielded over this part of Asia till the rise of the Ottoman princes, who like the Seljuks were Turks, and had been driven westward by the Mongols. Out of their supremacy grew the Turkish empire.

Sel'kirk, Alexander. See JUAN FERNANDEZ.

Sel'kirk Mountains, an outlying range of the Rocky mountains, in British Columbia, reaching southward almost to the United States boundary line. The range contains

enormous glaciers, and is the home of bears, big-horned sheep, Rocky Mountain sheep, etc. See W. S. Green's *Among the Selkirk Glaciers.*

Semele (*sem'e-lē*), in Greek story, was beloved by Zeus, and Hera, moved by jealousy, persuaded her to ask him to appear to her clothed in all his majesty as king of gods and men. Having sworn to grant her every request, and warned her in vain not to press her wish, he unwillingly yielded and appeared as the god of the thunderbolt. Semele was consumed by the lightning, but the child to which she was about to give birth was saved by Zeus. This child was Dionysus, the god of wine.

Seminoles (*sĕm'i-nōlz*), at first a wandering branch of Creek Indians. In 1817, they joined the Creeks and some refugee negroes in ravaging the white settlements in Georgia, plundering the plantations, and carrying off slaves, whom they refused to surrender. Gen. Andrew Jackson was sent to punish them, and his expedition hastened the cession of Florida to the United States (1819). The Seminoles, numbering 4,000 in 1823, by a treaty made in that year, sold most of their lands for a yearly sum. In 1832, a treaty for the removal of the whole tribe west of the Mississippi was signed by the chiefs, but the tribe, under the leadership of Osceola, would not ratify it. This led to a war, lasting seven years, and costing hundreds of lives and millions of dollars. At length the tribe was removed to the Indian territory, where are now settled all the Seminoles, some 3,000, except about 200 still lingering in Florida, and a few in Texas. The Seminoles are steady, sober, and industrious, and in the progress they have made rank next to the Cherokees, Creeks, and the Choctaws. They receive $25,000 a year, besides money to keep up their schools and government. They work about 8,000 acres of land. They have eight churches and are under the training of Presbyterian missionaries.

Semiramis (*se-mĭr'a-mĭs*), wife of Ninus, who, according to the Greek historians, founded Nineveh. A daughter of Derceto, the fish goddess, she was exposed to death when a baby, but miraculously fed by doves and brought up by a shepherd. Omnes, one of the king's generals, charmed by her beauty, married her; but she won the heart of the king himself by her heroic capture of Bactra, whereupon her husband had the loyalty to take his own life. Ninus soon died, leaving Semiramis to reign gloriously for forty-two years, conquering in Persia, Libya, and Æthiopia, but failing in her attack on India, where her army was cut to pieces by elephants. She at last disappeared, according to some stories, in the form of a dove. The name of the mighty queen survived in the names of many great works, such as the hanging gardens of Babylon, which were attributed to her. The Semiramis of the North was the name aptly given to Catherine II. of Russia.

Semites (*sem'ites*), a name applied to a group of nations, much alike in language, religion, manners, and looks, who are mostly represented in Genesis x. as descended from Shem, a son of Noah. Their home is Abyssinia, Arabia, Palestine, Phœnicia, Syria, and the countries of the Euphrates and Tigris. It is generally believed that as early as 4000 B. C. the Semites migrated as wandering tribes, probably from Arabia, into Mesopotamia. There they found a Turanian people dwelling in cities built of brick, under a regular government of priest-kings, skilled in metals and using the cuneiform mode of writing. Accad, Shumir, and Elam, were conquered, the Semites forming the upper classes of society and ruling the Turanians. Chedorlaomer, a king of Elam, about 2200 B. C., conquered as far as Palestine. Some Semites migrated northwest and founded Tyre, Sidon, and other cities on the Mediterranean, and became known as Canaanites and Phœnicians. Later, others came from Ur and founded the nation of Israelites. Still others built cities which grew into the Assyrian empire.

The Semites as a race have finely-developed bodies, quick and clever minds, but are not inclined to change. Almost their only arts are the sculpture of Assyria, the glass, pottery, cloth, and embroidery, of the Phœnicians. They have made their mark on the world in the Phœnician commerce and colonies; in the Carthaginian empire, and the exploits of Hannibal; in the spreading of the Phœnician alphabet, which is the mother of the European and most Asiatic alphabets, though it is not the oldest alphabet; in the Babylonian and Assyrian empires; in the Hebrew Bible and Jewish religion; in the New Testament and Christian religion; in the Koran and Mohammedan religion; in the Mohammedan conquests and empire, and in the preservation of learning through the dark and middle ages.

Semmes (*sĕmz*), **Raphael,** was born in Charles county, Md., Sept. 27, 1809. He entered the navy in 1826, and became a commander in 1855. He served during the Mexican war as a naval officer and also as an aide to General Worth. As commander of the Confederate steamer *Sumter*, he ran the blockade at the mouth of the Mississippi at the beginning of the Civil war. After capturing several merchant vessels in the gulf of Mexico, he sailed to England. On leaving Southampton he was pursued by the Federal steamer *Tuscarora*, blockaded at Tangier, and forced to sell his ship. In August, 1862, he took command of the famous *Alabama*, built in England and manned by an English crew. He then commenced a successful cruise against merchant vessels. He also

sank the gunboat *Hatteras* off Galveston; but on June 19, 1864, the *Alabama* was herself sunk by the *Kearsarge* in a sea fight off the harbor of Cherbourg, France. Semmes, however, escaped in an English yacht. He opened a law office at Mobile after the war closed, but was arrested and suffered a four months' imprisonment. He afterward wrote and lectured on his adventures during the war. Semmes died at Mobile, Ala., Aug. 30, 1877.

Sempach (*sem'päk*), **Battle of.** See WINKELRIED, ARNOLD VON.

Seneca (*sen'e-kă*), whose father was a prominent writer, was a Spaniard, born at Corduba (Cordova) about 4 B. C. He studied law at Rome, where he narrowly escaped being put to death by the Emperor Caligula. Later in life he entered the Roman Curia, but in 41 A. D. lost the favor of Claudius and suffered an eight years' banishment to Corsica. After his return, he became tutor to Nero, over whom he had a strong and good influence, and was made consul, in 57 A. D., by his pupil, who was now emperor. As Nero rapidly sank into crime, Seneca's high moral character aroused in him hatred, while his teacher's wealth, heaped on him by himself, is said to have made the emperor jealous. Nero tried to poison him, but failing in this, had him drawn into the Pisonian conspiracy, for which he was tried and condemned. Left free to choose his own death, he opened his veins and bled to death, 65 A. D. Seneca was a noble and upright man, yet had many enemies. *On Foresight*, *On Shortness of Life*, and *Epistles to Lucilius*, are some of his writings, besides epigrams and eight tragedies, which show great mastery of style, but are unfitted for the stage. For a striking portrait of Seneca, see Hugh Westbury's *Acté*.

Sen'eca Lake, one of a range of narrow lakes in the western part of New York. It is 36 miles long, and averages two miles in width, and 530 feet in depth. Steamboats ply daily from end to end. It flows into Lake Ontario through the Seneca and Oswego rivers, and is joined by canal to the Erie canal.

Sen'ecas, one of the Iroquois tribes of Indians. See IROQUOIS.

Senegal (*sen'e-gal*), a river of West Africa, has two sources, the Bafing and the Bakhoy. These streams meet at Bafulabé, 700 miles from the coast, the united Senegal reaching the Atlantic ten miles below St. Louis. From July to October the river is navigable to within forty miles of Bafulabé, but the channel has in it many falls, narrows, and low, flat islands. A railroad has been built along the left bank for sixty-five miles, from Kayes to Dioubeba, which is to be carried on to Bammako on the Niger.

Senegal (*sĕn'e-gal*), a French colony on the west coast of Africa, lying between the Sahara and the river Gambia, and extending inland for about 900 miles. It covers an area of about 200,000 square miles, with a population of about 3,200,000. The whole colony is administered directly or indirectly by a civil governor. The communes of St. Louis, Dakar, Gorée, and Rufisque are directly under the governor; nine circles are under other administrators, while other districts are self-governed, under French protectorate. The colony is represented in the French parliament by one deputy. In 1900, the military force numbered 2,600 men. Dakar is fortified. In 1897, the four chief towns had nine schools, with 67 teachers and 1,986 pupils. The natives cultivate millet, corn, rice; other products are gums, castor beans, groundnuts, cocoanuts, rubber, and kola. The domestic animals are cattle, sheep, goats, and camels. Gold, silver, copper, and quicksilver are found in some localities. The native industries comprise weaving, pottery, brickmaking, and jewelry. The imports in 1899 amounted in value to 52,425,000 francs, and the exports to 23,725,000 francs. In 1898, there were in Senegal 246 miles of railway and 574 miles of telegraph. One line connects Dakar, St. Louis, and Rufisque; another from Kayes to Bafulabé is being extended to the Niger.

Sennacherib (*sĕn-nak'e-rib*), an Assyrian king, son of Sargon, reigned from 705 to 681 B. C. He built the embankment of the Tigris, made canals and water courses, built a huge palace at Nineveh, and was the founder of many other public works. The chief acts of his reign are given under ASSYRIA.

Sen'sitive Plants. All plants are more or less sensitive, that is, able to respond to stimuli. Some plants, however, respond so quickly and so evidently that they have been popularly called "sensitive plants." Conspicuous among them are species of Mimosa, Acacia, and their allies, members of the pea family. These particular plants have large compound leaves composed of numerous and very small leaflets. At a sudden touch the paired leaflets fold together, or the whole leaf may fold up and its petiole droop. In the natural surroundings of these plants this folding up of the leaves has to do with the avoidance of too intense light, or drought, etc., the surface of exposure thus being diminished in exact proportion to the need.

Seoul (*sā-ōl'*), capital of Korea, is on the river Han, 75 miles from its entrance into the Yellow sea. It is in a basin in the midst of granite hills and is surrounded by a wall. Narrow, dirty streets, wide, open squares, poorly built houses, and a royal palace covering 600 acres, make up the city. Silk, paper, tobacco, mats, and fans are produced. Population 150,000, with suburbs, 250,000.

Se'pal (in plants), one of the parts which together make up the calyx or outer set of floral leaves. See FLOWER.

(*s, s*) Sepals.

Se'poy, a native Hindu soldier, as distinguished from a gora or white soldier. Sepoys have always been volunteers. The French first employed them in the 18th century. The East India company had 10,000 Sepoys at the time of the battle of Plassy. This force had grown to 45,000 by the time the first governor-general was appointed (1773). Their discipline, faithfulness, and good services caused general belief in their loyalty until the outbreak of the great Sepoy rebellion in 1857. The army was then 300,000 strong, all Sepoys but 40,000. The rising took place among the high caste Hindus, who made up the Bengal army. The Sepoy forces of Madras, Bombay, and the Punjab took no part in it. This rebellion cost the British $200,000,000. Since 1857, the proportion of Sepoys to Europeans is less, it being now two to one instead of six to one.

Septem'ber, from the Latin word meaning seven, was the seventh month of the Roman calendar, but is the ninth according to our reckoning. The Anglo-Saxons called it gerstmonath, "barley month."

Sequoia (*sē-kwoi'a*), a genus of the Conifers, whose two species are native only in California. They are the famous "redwoods" or "big trees," and form one of the attractions to visitors in California. The species are *S. sempervirens*, the true redwood, and *S. gigantea*, the giant redwood. The former grows only in the Coast ranges, and is abundant enough to be a very important lumber tree. The recorded sizes are from 50 to 75 feet in circumference and 200 to 275 feet in height. The giant redwood occurs in patches or "groves" in a narrow strip along the western slope of the Sierra Nevada. Among the most famous groves are those of Calaveras county, and the Mariposa grove just south of the Yosemite. The latter contains one of the largest standing trees, known as the "Grizzly Giant," whose trunk at the ground is more than 93 feet in circumference. The age of the largest trees is from 2,000 to 2,500 years. In former ages, sequoias were widely distributed throughout the world.

Sera'pis, the Greek name of an Egyptian god, introduced into Egypt in the time of Ptolemy Soter. He was a combination of the Greek Hades and the Egyptian Osiris. It is said that 42 temples were built for the worship of this god, though they were only admitted into the Greek cities founded in Egypt. The best known of these temples was the magnificent Serapeum at Alexandria, to which was joined the celebrated Alexandrine library. Antoninus Pius introduced the worship of Serapis into Rome, but it was soon abolished. Many Roman coins have his image joined to that of Isis. The worship of Serapis ceased in Egypt only when his image in Alexandria was destroyed by the Christian archbishop of the city, in 398 A. D.

Serf. See SLAVERY.

Ser'pentine, a mineral made up of silica, magnesia, and water, with a little protoxide of iron. Serpentine is usually found in masses, never in crystals; is generally some shade of green, but is sometimes red or brownish-yellow, and feels smooth, but often greasy. Precious or noble serpentine is a rich, dark green, hard enough to take a good polish, translucent, and sometimes has imbedded in it garnets, which form red spots and add to its beauty. It is a rather rare mineral, and is found at Baireuth (Germany), in Corsica, and in the Shetland islands. The Romans made of it beautiful pillars, and boxes, vases, etc., are still cut from it. Marmolite is a scaly serpentine; chrysolite is a kind with delicate fibers and a silky luster. Common serpentine is a rock rather than a mineral. Its name comes from its being often marked with winding veins. Its color is usually green or red, often mottled, veined, or clouded.

Ser'pents. See SNAKES.

Ser'pent Wor'ship is one of the oldest forms of religion, and still exists among many savage peoples. Serpent worship is prominent in Indian Buddhism. We see traces of it in the great serpent which defended the citadel of Athens, fed every month with honey cakes. Among Zulus, harmless green or brown snakes which come boldly into the houses are thought to be ancestors, and are often identified by some scar or mark, such as the man bore in life. Serpents are often looked upon as the embodiment of gods, such as the rattlesnake worshiped in the Natchez temple of the Sun; the Phœnician serpent with its tail in its mouth, an emblem of eternity. Reverence for the serpent is notable among the red Indians, where its name has been given to rivers, as the Kennebec and the Antietam. Among the Dakotas, Shawnees, and Sacs, the words for spirit and snake are similar. The Algonquins think the lightning a huge snake, and the Caribs speak of the god of the thunder storm as a mighty serpent. The Ojibways dread to kill a rattlesnake, and if they find one in their path, beseech it to go away and spare them and their families. The same worship is found among the Cherokees and other tribes, as well as in the strange snake dances of the Zuñis. See Fergusson's *Tree and Serpent Worship.*

Servia (*ser'vi-a*), a kingdom of the Balkan peninsula, reaching from Hungary on the north to Turkey on the south, and from Bosnia on the west to Bulgaria and Rumania on

the east. It covers 18,455 square miles, measuring 140 miles from east to west and 110 miles from north to south. It is on the whole a mountainous country, covered with fine forests. Servia is an agricultural country. Wheat, corn, grapes, and plums are the chief crops. Cattle, sheep, and acorn-fed hogs are exported, as are also hides, wool, timber, and cordage. The foreign trade is mostly in the hands of Austria-Hungary, and its center is at Belgrade, the capital (population 60,000). Manufactures are not yet of great value, but are being fostered by government gifts of monopolies.

The Servians are a well-built, stalwart race. They cling to old customs and beliefs, and are democratic in their institutions. The farms are all of small size. There are no paupers, asylums, or "homes" in Servia. Population, 2,312,484, including 150,000 Rumanians and 34,000 gypsies. Besides these, there are 250,000 Servians in Montenegro, 1,300,000 in Herzegovina, and 2,350,000 in Austria-Hungary. The people belong to the Greek Orthodox church.

Servia is a constitutional and hereditary monarchy. The king rules through eight ministers, who are accountable to the people. There is also a national assembly and a senate. The army takes in all capable of bearing arms between the ages of twenty and fifty, divided into the standing army, in peace 22,448, in war 160,751, and the second and third classes of national militia, numbering 192,615. Thus the full average military strength is 353,366.

Elementary education in Servia is compulsory. In 1900, there were 1,105 elementary schools, with 1,921 teachers and 100,901 pupils; 16 higher schools, with 357 teachers and 5,712 students. The university at Belgrade has 62 instructors and an attendance of 463 students. Servia has 354 miles of railway and 2,526 miles of telegraph line.

The Servians came from the slopes of the Carpathians to Servia, Bosnia, and Herzegovina in the year 638, and soon accepted Christianity. Under their feudal lords, they on the whole withstood the Byzantine empire and the Bulgarians. The Rascian dynasty was founded in 1159. Its greatest prince was Stephan Dushan (1336–56), who conquered Bulgaria, Macedonia, Albania, and thought of welding Servia, Bulgaria, and Byzantium into a power strong enough to withstand the Turks. But he died before anything could be done, and left a feeble son. By the loss of two battles to the Turks, that on the Maritza in 1371, and the Field of the Blackbirds in 1389, Servia lost its independence. Then followed three hundred years of Turkish cruelty, many chief families being blotted out, 200,000 people carried off as slaves, while the boys every seven years were forced to become Moslems and Janizaries. In 1718, Austria won Servia from Turkey, but had to give it up twenty-one years later. In 1804, the people rose under Czerny George ("Black George"), a wealthy swine owner, who stormed and took Belgrade and drove the Janizaries out of the country. In 1809, and 1810, the Turks were beaten off only with the help of the Russians, who agreed by treaty that the sultan should garrison the country, but that the Servians should manage their home affairs themselves. The Turks broke the treaty, and Czerny George fled to Austria; but in 1815 a new leader Milosh Obrenovitch, a herdsman, confined the Turks to their garrisons. He had his rival, Czerny George, murdered, and by 1829 was acknowledged prince of Servia. His rule was very despotic, and in 1839 he was forced to yield the throne to his son, Milan, who was soon succeeded by his brother, Michael. Three years later, the rival faction replaced Michael by Alexander, the son of Czerny George, a weak ruler, who was driven out in 1859. The aged Milosh Obrenovitch was again made prince and was soon succeeded by his son, Michael. His rule was able, and in 1867 the last Turkish garrison was withdrawn. A year later he was assassinated. His cousin, Milan (1868–89) took part in the Russo-Turkish war, whereby Servia gained her independence, and was crowned king as Milan I. in 1882. In 1889, he gave up the throne to his son, Alexander, then thirteen years old. On April 13, 1893, King Alexander, being then in his seventeenth year, took the royal authority into his own hands. See Laveleye's *The Balkan Peninsula.*

Sesostris (*se-sos'tris*), the Greek name of a celebrated Egyptian king. According to the Greek accounts, Sesostris at the head of a large army invaded Libya, Arabia, Asia, Europe, Thrace, and Scythia, leaving a colony at Colchis on his way home. In the south he conquered Ethiopia, and by means of his fleet on the Red sea got possession of the neighboring islands, and widened his dominions to India itself. Captives in great numbers were put to work on temples, canals, and mounds. Sesostris is said to have gone blind after a reign of thirty-three years, and to have taken his own life. Just who this great conqueror was is a puzzle. The most reasonable explanation is that his doings are the confused exploits of Sethos I. and Rameses II.

Set'ter, a breed of dog employed in shooting birds. There are three varieties—the English setter, the Gordon setter, and the Irish setter. Dogs had been trained from the 16th century to scent game, but it was not until the beginning of the 19th century that a record of a distinct breed of setter was begun. The English setter is generally white with red markings, or with black spots. The Gordon setter was bred by the duke of Gordon in the year 1800, by crossing the existing setter with the collie. This setter should be a rich and glossy black, marked with tan on the

face, chest, and legs. The origin of the Irish setter with its deep chestnut-red color is unknown.

Sev'en Sleep'ers, the heroes of a celebrated tale. During the flight of the Christians from the persecution under Decius, seven Christians of Ephesus took refuge in a cave near the city, where they were discovered by their pursuers, who walled up the entrance in order to starve them to death. Instead they fell into a sleep which lasted from 250 or 251 to the reign of Theodosius (447). They imagined that their sleep had been but for a night. One of the seven went secretly into the city to buy food, and was thunderstruck to see the cross on churches and other buildings. Offering a coin of Decius at a bakery he was arrested, his startling story not being believed till he guided the citizens to the cave where he had left his comrades. The emperor heard from their lips enough to make him believe in the life beyond the grave, whereupon they sank again to sleep till the resurrection. The Roman Catholic church holds their festival on June 27. The story was adopted by Mohammed. A like story is told in Germany. See Rydberg's *Teutonic Mythology.*

Sev'en Wise Men, Greek sages, whose lives were embodied in certain maxims. Their names and characteristic sayings are as follows: Solon of Athens — "Nothing in excess"; Thales of Miletus — "Suretyship brings ruin"; Pittacus of Mitylene — "Know thine opportunity"; Bias of Priene, in Ionia — "Too many workers spoil the work"; Chilon of Sparta — "Know thyself"; Cleobulus, tyrant of Lindus, in Rhodes — "Moderation is the chief good"; and Periander, tyrant of Corinth — "Forethought in all things."

Sev'en Won'ders of the World were in early times reckoned to be the Pyramids of Egypt, the Hanging (that is, terraced) Gardens of Semiramis at Babylon, the temple of Diana at Ephesus, the Statue of Jupiter at Athens by Phidias, the Mausoleum, the Colossus at Rhodes, and the Pharos (or lighthouse) at Alexandria.

Sev'en Years' War (1756–1763). A struggle in Europe, which had far-reaching results, between Prussia under Frederick the Great, and a confederacy of European powers, consisting mainly of Austria, under the Empress Maria Theresa, Russia, Saxony, Sweden, and France. The immediate object of the war was to enable Austria to regain possession of Silesia, whose duchies, in 1740, had been seized by Frederick, and this precipitated a strife known as the Seven Years' War, or the third Silesian war. With Prussia was allied England, under George II., who sought thus to secure his Hanoverian possessions against France, and between which and the English there had been a growing ill-feeling, in consequence of rivalry in the American colonies and in India. On the part of the confederacy of Austria, Russia, and France, the feeling that led on to the war was European jealousy of the growing power of Prussia, whose prestige had been greatly raised by the genius of Frederick, and who on the outbreak of the war made himself master of Saxony by the defeat of the Austrians at Lobositz (October, 1756), temporarily invaded Bohemia, and again inflicted defeat upon the Austrians (at Prague, May, 1757), followed by victories, later in the year, over the French and Austrians at Rossbach, and over the Austrians alone at Leuthen (December, 1757). Through varying fortune, Frederick's military genius enabled him, in the two ensuing years, to wrest victories from the Russians at Zorndorf and from the French at Minden, though his capital was taken by the Russians and was subject to a three-days' plunder. In 1761, the English, owing to the death of George II., withdrew her subsidies to Prussia; but Frederick's straits were somewhat relieved in the following year, when Elizabeth of Russia died, and Peter III., her successor, in his few months' reign, made peace with Prussia. Sweden and France fell away from the alliance, and at Hubertusburg, Austria, too weak to carry on the war alone, made peace with Prussia, Feb. 15, 1763, and Silesia was confirmed as a possession of Frederick.

Aside from European complications, there was at this time, between England and France, cause enough for war, in the friction between the two nations, owing to their rivalries in India and in North America, and the desire of both to settle the question who should be master of these vast continents. In America, France, as we have seen in the French and Indian wars (*q. v.*), had colonized Canada and Louisiana, while England has established colonies along that part of the Atlantic coast which separated the French settlements. To connect the latter, and to exclude England from the great fur-trade of the interior, France, as we know, erected a series of military posts from the Niagara river to the mouth of the Mississippi. This was naturally resented by England and her New England colonies and precipitated a conflict in the Ohio valley and on the St. Lawrence, which had its fateful issue in the crowning English victory of the conquest of Quebec, and the surrender of the whole of Canada to Britain. Joy at the capture of this stronghold on the St. Lawrence was saddened by the deaths of the gallant British commander, General Wolfe, and the equally gallant French commander, General Montcalm. In India, English prowess met with like good fortune and decided the question of supremacy. There, the East India Company had founded settlements for purposes of trade, which gave promise of extending to an empire; but France, jealous of her hereditary rival, endeavored to snatch from her the prize. Dupleix, the French governor of Pondicherry,

captured Madras, and by intriguing with the native princes, attempted to make French power supreme over the country. In this ambitious scheme he was, however, checkmated by Lord Clive, who from a clerkship in the East India company rose to be one of the greatest of English generals and the saviour of India. Clive captured Arcot, and in 1757, when the sovereignty of Bengal was in peril, he won a great victory over the native insurgents at Plassey, which made Bengal a British province, saved the English residents from massacre, and, in spite of the atrocity of the Black Hole at Calcutta, laid the foundations of British rule in India. The war, which raised Prussia to the front rank among European powers, and developed England's colonial empire, was marked by sundry naval victories which fell to the English, such as the affairs at Louisburg, Lagos, and of Quiberon bay. See Carlyle's *Frederick the Great*, and Lives of *William Pitt, General Wolfe*, and *Lord Robert Clive;* also Parkman's *Montcalm and Wolfe.*

Severn (*sev'ern*), next to the largest river of England, rises in Wales and after a course of 210 miles falls into the Bristol channel. It is navigable for 180 miles; a canal has helped navigation from Gloucester, and is now being extended to Worcester. Below Gloucester, the swiftly flowing tide produces a bore or wave five or six feet high. The Severn is a beautiful as well as an important river.

Severus (*sē-vē'rus*), **Alexander,** a Roman emperor, was born about 205 A. D. He was the adopted son of the emperor Heliogabalus, who, in his jealousy of the young man's popularity, vainly tried to kill him. Severus became emperor in 222. The first nine years of his reign were peaceful, but in 231 he began a war with the Persians, in which he was successful. In 235, he began a campaign against the Germans on the Rhine, in which he lost his life, not at the hands of the enemy, but at those of his own soldiers.

Seve'rus, L. Septimius, a Roman emperor and a vigorous and courageous soldier, was born in Africa, 146 A. D. At the time of the murder of Pertinax (193) he was in command of an army in Pannonia and Illyria. At once proclaimed emperor, he marched on Rome, which was held by Julianus, who had obtained the throne of the Cæsars by bribery. Julianus and the murderers of Pertinax were punished, one rival, Clodius Albinus, won over by the gift of the title of Cæsar, the soldiers flattered by a rich largess, and a second rival conquered at Issus. A glorious campaign in the east and the three years' siege and capture of Byzantium, were followed by a hard struggle with the jealous Clodius, whom he defeated near Lyons in 197. After the usual games to the citizens of Rome and largesses to the troops, he marched on the Parthians and took and plundered their capital, Ctesiphon. By 202 he was again in Rome, pleasing the people with shows of unheard-of magnificence, and showering gold upon citizens and officers. In 208, he marched at the head of a large army to put down a rebellion in Britain, and repaired Hadrian's wall, which is often called after him. He died at York (Eboracum), Feb. 4, 211.

Sevigne (*sā-vēn-yā'*), **Madame de,** the queen of letter writers, was born at Paris, as Marie de Rabutin-Chantal, Feb. 6, 1626. Her father died fighting against the English when she was one year old; her mother also died a few years later, and Marie was brought up by an uncle who had her taught Latin, Italian, and Spanish. At eighteen she married a spendthrift marquis, whom she forgave and loved. At the death of her husband, in a duel in 1651, she was but twenty-five, brilliant in her beauty and fascination. The prince of Conti, Turenne, Rohan, and others courted her in vain. But no woman ever knew, as she did, how to change a lover into a friend, and perhaps no one ever had so many and such friends. But as to love, that was wholly bound up in her son and daughter. Especially did Madame de Sévigné's love overflow for the girl, Françoise Marguerite, whose beauty, as far as mere features went, surpassed her mother's, and whose first appearance at court, when sixteen, as "the prettiest girl in France," filled that mother's heart with joy. The marriage of Françoise to the count of Grignan, lieutenant-général of Provence, obliged her to live away from Paris. This separation from her daughter was the great grief of Madame de Sévigné's life, but it is mainly to it that we owe those letters, lasting over the twenty-five years till her death. These letters tell the inner history of the time in great detail; but are most valuable as mere letters, charming in their good sense, sparkling wit, and in the affection breathed into them. The writer died April 18, 1696. See Amelia Gere Mason's *Women of the French Salons.*

Seville (*sā-vēl'*), one of the most famous Spanish cities, is on the Guadalquivir, 62 miles northeast of Cadiz. Up to a short time ago Seville had the appearance of a picturesque Moorish town — narrow shaded streets, houses built around handsome courts and gardens, and fountain-studded squares. But now room has been made for wide, straight streets, and modern houses and shops. The great ornament of the city is its Gothic cathedral, one of the largest in Europe, containing paintings by Murillo and others, a great organ, the tombs of Ferdinand III. of Castile, and Ferdinand the son of Columbus, and fine bronze, sculptured, and wood-carving work. Close beside stands the beautiful tower called Giralda, 275 feet high. Another of the glories of Seville is the Alcazar, or Moorish royal palace, whose halls and gardens are surpassed only by those of the Alhambra. The museum and charity hospi-

tal both contain masterpieces by Murillo. The bull-ring can accommodate 18,000 spectators. The leading manufactures are cigars, iron, machinery, and pottery. Seville is also a large port of entry. The largest imports are chemicals and timber; the chief exports, lead, quicksilver, wine, copper, oranges, olives, olive oil, and corks. This city was the Roman Hispalis, a place of trade in those days. Under the name Ishbilia, from 712 to 1248 it was an important Moorish city. When Ferdinand III. of Castile captured it (1248) about 300,000 Moors abandoned the place. Population 146,205.

Sevres (*sāvr*), a small town in France, 2½ miles southwest of Paris, celebrated for its porcelain. The Sèvres vases are of great value and are known the world over. Painted glass and mosaic are also made. Porcelain has been manufactured under state control since 1756. See Garnier's *Soft Porcelain of Sevres.*

Sew'erage, a system of underground pipes or conduits for the removal of sewage or the rain water of a place. Sewerage is required for sanitary reasons in towns and cities. In the country where the population is not dense, the sewage can be disposed of without any elaborate system, though care must always be taken that the water supply is not contaminated. The construction of elaborate sewer systems is found in ancient cities, such as Babylon, Jerusalem, and Rome, but it is only within recent years that it has received the attention it deserves in modern cities. There are two systems in use, the combined and the separate system. In the combined system, the same pipes carry both the sewage and the storm water; in the separate system, called the "Waring system," there are separate pipes for the sewage and the storm water. In the latter system, the flushing is done by automatic flush tanks supplied with water from the town waterworks. The separate system is recommended by most sanitary engineers. The liquid sewage may flow due to the fall of the pipes, but in many cases pumping has to be resorted to. Among the methods of sewerage disposal are the following: (*a*) by dilution by discharge into a large mass of flowing water which is not used for a water supply, as at New York city and in towns on the lower Mississippi; (*b*) by running the liquid sewage over a large area of land and letting it oxidize in the air; (*c*) by chemical treatment so as to kill the organic life. In some cases, as at Berlin, Germany, the sewage is used to fertilize land which is cultivated. The city of Chicago has constructed a drainage canal at a cost of $33,000,000 to dispose of its sewage by dilution with a large body of water taken from Lake Michigan and emptied into the Illinois river.

Seward (*sū'ärd*), **William Henry,** was born at Florida, N. Y., May 16, 1801. He graduated at Union college in 1820, and became a lawyer. He joined the Whigs, being the party leader in the state senate from 1830 to 1834. Defeated for the governorship in 1834, he was elected in 1838 and again in 1840. He refused a nomination for a third term, and between 1843 and 1849, when he entered the United States senate, he gained an enviable reputation as a criminal and patent lawyer. While governor he had refused to surrender to the governor of Virginia three negro seamen, demanded on the charge of inciting a slave to escape. He was against the admission of Texas as a slave-holding state, and thus became marked as an opponent of slavery. His speech in defense of the negro murderer Freeman, Gladstone has called "the greatest forensic effort in the English language." Two terms as senator brought him to the front as an able and patriotic statesman, and when the Republican party was formed he became one of its first leaders. A strong candidate for the presidential nomination in 1860, Seward entered Lincoln's cabinet as its head, filling the office of secretary of state from 1861 to 1869. His moderation in the *Trent* affair, in which he advised giving up the envoys, as demanded by England, probably saved us from a war with Britain. His claim for damages from the English government, because of the *Alabama's* being fitted out in British ports, was sustained. His most important service to the country was, perhaps, his purchase of Alaska from Russia in 1867. In the spring of 1865, Mr. Seward was thrown from his carriage, breaking his jaw and an arm. While confined to bed, on the night of Lincoln's assassination, April 14, one of the conspirators made his way to the secretary's room and severely cut his face and neck. Seward died at Auburn, N. Y., Oct. 10, 1872. See *Life and Letters*, by his son.

WILLIAM HENRY SEWARD.

Sew'ing Machine, a machine which takes the place of the old-fashioned needle and thread in sewing garments. Several attempts were made in England and the United States to invent a machine for sewing, but without much success until Elias Howe, of Cambridge, Mass., patented his first machine in 1846. This machine uses the lock-stitch, which is used by most machines now, and from 1854 until the patents expired, Howe received a

"royalty" on every machine made, amounting to over $2,000,000. The lock-stitch makes use of two threads, one in the needle which pushes the thread down through the cloth, forming a loop; the other thread is wound on a bobbin and placed in a shuttle which carries the second thread through the loop made by the first one. The rotating hook is used instead of a shuttle in some machines. The loop-stitch is made by a curved needle which catches the loop made by the upper needle, and passes the thread through it. The most important improvement on Howe's original machine was made by Allan B. Wilson in his "four-motioned feed," which carries the work along, and has been adopted in all machines. There are a large variety of machines, differing slightly, and also those made for different purposes. The family sewing machine has revolutionized the work of the home; the button-hole machine cuts the hole, works it around, bars the ends, stops of itself when it is done, and makes 6,000 buttonholes in a day; the carpet-sewing machine, the cylinder machine for stitching mailbags, satchels, shoes, water-hose, and all kinds of leather work; the universal arm-feeder machine for making gloves; the basting and quilting machine; the pattern-stitching machine, are a few of the varieties in use. The largest sewing machine manufacturing company is the Singer, which has factories in Scotland, Austria, Canada, and the United States. Since 1878, when the principal patents expired, the price of sewing machines has been much reduced.

Sex'tant. See QUAD'RANT.

Sex'ual Spore (in plants), a spore which has been produced by the union of two gametes, that is, by fertilization. The general name of such a spore is "oöspore" or "fertilized egg." The name is unfortunate, since the spore is not sexual, the full phrase merely meaning a sexually formed spore. See SPORE.

Sey'mour, Hora'tio, was born at Pompey, N. Y., May 31, 1810. He studied at a military school and became a lawyer. In 1841, he entered the assembly as a Democrat, and was three times re-elected, in 1845 being chosen speaker. Defeated for governor in 1850, he was elected by a large majority two years later. The prohibition, know-nothing, and antislavery questions combined to defeat Seymour in the election of 1854. Seymour came into great prominence as one of New York's "war governors," holding this office during the draft riots in New York city. He presided over the Democratic national convention of 1868, which was held in New York. He had refused to be a candidate, but on the 22d ballot was nominated for the presidency by a sudden wave of enthusiasm, in spite of his loudly spoken protestations. He, however, received but eighty electoral votes. He died at Utica, N. Y., Feb. 12, 1886.

Sforza (*sfort'sȧ*), **Frances'co,** when twenty-three years old succeeded his father, Muzio Attendolo, the founder of the family, who was called Sforza, meaning "stormer" (of cities), in command of a famous band of *condottiere*, soldiers who sold their swords to the highest bidder. He fought at times for and against the pope, Milan, Venice, and Florence. He invented a better system of tactics than had been in use, and it soon came to be taken for granted that victory was certain for the party which had his support. So it came about naturally that the peasant chief won the hand of Bianca, the only child of the duke of Milan. Meanwhile, Sforza wrested Ancona and Pesaro from the pope. At the death of his father-in-law, in 1450, he gained the dukedom by a combination of stratagem and force. He made firm his authority over all Lombardy and several districts south of the Po, gained the favor of Louis XI., who gave him Savona and Genoa, and won the love of all his subjects. Though himself ignorant, he loved and protected letters. Sforza died March 8, 1466, at the age of sixty-five, and was followed by five dukes of the Sforza family.

Shad, an important food fish belonging to the herring family. The American shad is more valued than the European species. It ranges along the Atlantic coast from New England to the gulf of Mexico and ascends different rivers to spawn. This species has been successfully introduced on the Pacific coast. The full-grown fish is about thirty inches long. Its color is bluish, with silvery sides and usually a dark blotch behind the gill covers, and often several in a row behind this. These fish were among the first to be protected and artificially propagated by the United States Fish commission. The result of this care was to increase greatly their numbers. Statistics show that the catch of shad in 1890 was two and one-half times that of 1880.

Shad'dock, a native tree of the East Indies, which has been long grown in southern Europe. Its name is said to come from a Captain Shaddock, who introduced it into the West Indies in 1810. It has large, white flowers, and its fruit is also very large, sometimes weighing fron 10 to 14 pounds, roundish and pale yellow. The pulp is green, watery, and has a slight acid taste. Finer and smaller than the shaddock proper is the pomelo (also called pummelo, pompelmoose, and grapefruit), a variety rather larger than an orange, which bears its fruit in clusters. Both kinds are grown in Florida and sold in the north.

Shad'ow, a term in optics employed to denote the region immediately behind an opaque object which cannot be illuminated by a source of light in front of the opaque object. If the source of light is a single point, we find that the shadow is geometrically similar to

the outline of the opaque object, which is a consequence of the fact that light moves in straight lines in a homogenous medium. Such a shadow is exhibited in Fig. 1. In case the luminous source is not a single point, but an extended body, we find the shadow consists of two parts, one a central, dark area,

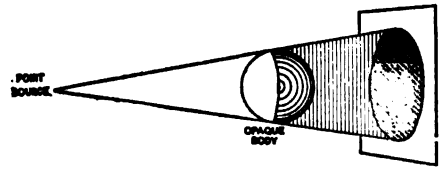


FIG. 1.

called the *umbra*, the other a partly illuminated border, called the *penumbra*. This is well illustrated in the case of the sun and earth shown in Fig. 2.

The penumbra, as will be evident from the figure, is merely that region which is illuminated by some but not by all points on the luminous source. The more nearly a source

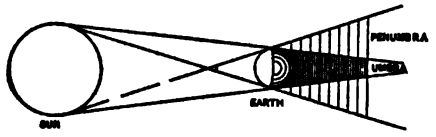


FIG. 2.

approximates a point the more nearly does the penumbra vanish. This almost complete absence of penumbra is well shown in the shadows cast by naked electric arcs.

In case a shadow is produced by a point source it is always accompanied by a series of diffraction fringes, called, after their discoverer, "Grimaldi's fringes." These are beautifully shown in the case of the naked arc light, where the first three fringes of the series are easily seen bordering the shadow of each twig on a tree, or the shadow of one's lead pencil cast on a sheet of white paper. For explanation of these fringes, see Preston's *Theory of Light* (Macmillan & Co.).

Shaf'ter, William Rufus, American general, was born at Galesburg, Mich., Oct. 16, 1835. In 1861, he entered the Union army as lieutenant in the 7th regiment of Michigan volunteers, and distinguished himself in the campaigns under McClellan in Virginia. He rose to be lieutenant-colonel and subsequently organized a regiment of colored troops, when he was brevetted brigadier-general for gallantry in action. When the volunteer army was disbanded at the close of the Civil war, he entered the regular army as lieutenant-colonel of the 41st United States infantry. After this he rose to be colonel, and then brigadier-general in 1897. On the outbreak of the war with Spain, he was put in command of an expedition setting out for Cuba, with the rank of major-general of volunteers. In May, 1898, he proceeded to Tampa, Fla., then to Cuba, where in June and July of that year he commanded the military operations which ended in the capitulation of Santiago de Cuba and the surrender of General Linares' army of over 20,000 men. He subsequently was in command of the department of California and Columbia, and was retired June 30, 1901.

Shag. See COR'MORANT.

Shagreen', a name given to the skins of sharks, rays, and other fish of the same family. These skins have a covering of small hard grains, which stand wear better than ordinary leather. Such skins when prepared like parchment, dyed and smoothed, have an attractive look, and are used for covering small caskets, cigar cases, spectacle cases, and small boxes. The name "shagreen," a Persian word meaning the back of a beast of burden, is also, and perhaps was first given to skins of horses, asses, and other animals, prepared by unhairing and scraping them. Each piece is then stretched on a frame and while still moist the seeds of a kind of chenopodium are sprinkled on the surface and forced in by the feet or a press. When the skin is dry the seeds are beaten out, leaving a pitted appearance. It is then pared down and placed in water till the pits swell and give the skin a pimpled look, like that of the shark. The covers of old Persian manuscripts are made of this shagreen, which is also used in the east for horse trappings and shoes. Wood is embossed sometimes in a like way.

Shah'jahan'pur, a city of British India, in the northwest provinces, is 100 miles northwest of Lucknow. It takes its name from Shah-Jehan, in whose reign it was founded in 1647. It was a hotbed of rebellion during the mutiny of 1857–58. Sugar is made and exported here. Population 78,522.

Shah-Jehan', the fifth of the Mogul emperors of Delhi, during his father's reign fought against the Rajputs, the Mohammedan states of the Deccan, and the Afghan tribes around Kandahar. For the last four years of the reign of his father, the emperor Jahangir, he was in open rebellion. Greeted as emperor by the nobles on Jahangir's death in 1627, he began a warlike and successful reign, conquering the Deccan kings of Ahmadnagur, Bijapur, and Golconda, though failing to recover Kandahar from the Persians. He was an able and just ruler, and a good business manager as well. The magnificence of his court was unequaled. The splendid "peacock throne" was built by his orders at a cost of nearly $35,000,000. Of other great public buildings which remain as a monument of his greatness are the grand Taj Mahal and the matchless "pearl mosque" at Agra, and the palace and great mosque at Delhi. He was deposed in 1658 by his son Aurung-zeb, and died in 1666.

Shak'ers, a religious sect. They arose in England about the middle of the 18th century, under the leadership of a tailor, James Wardlaw and his wife. They were Quakers, but professed to have had a revelation that the second coming of Christ was at hand, and that he would appear in the form of a woman. Ann Lee was one of their first converts, and her preaching drew such crowds that she and the Wardlaws were imprisoned. While in prison she professed to have received another revelation, which made her accepted as the female Christ whose reign had been promised. She was called Mother Lee, and is considered the head of the Shakers. The new kingdom, by revelation they learned, was to be set up in America, and the first settlement was made in Albany county, five miles from Albany. Their special doctrines are holding property in common; celibacy, or refraining from marriage; and the duty of labor. They have no creed, but are taught by special revelation. Jesus Christ they consider to be a divinely inspired man, representing the fatherhood of God, and Ann Lee as inspired to reveal the motherhood of God. They live in families of brothers and sisters, presided over by elders and elderesses, and deacons and deaconesses. They are very neat and industrious, and are known for their flower seeds and herbs which they raise for market. They make use of singing and dancing in their worship, which has given them their name, their own title being the United Society of Believers in Christ's Second Appearing. They have fifteen settlements in the United States, several of them called Lebanon, from New Lebanon, N. Y., which was the second established in the country. Their property is valued at $10,000,000, and they number 1,728 members. See ANN LEE. See also *The Shakers*, by Evans.

Shakes'peare, William, the greatest English poet and playwright, was born at Stratford-on-Avon, England, near the end of April, 1564, the eldest son and third child of John Shakespeare. He probably went to free school at Stratford. In 1578, his father, who could not sign his own name, but had risen to be high bailiff of Stratford, began to lose money. It is thought that soon after this William was taken out of school, and either apprenticed to a butcher or else worked as a lawyer's clerk. In 1582 Shakespeare married Anne Hathaway. He had three children, a daughter, Susanna, and twins — a boy, Hammet, who died when twelve years old, and a girl, Judith. Both daughters outlived their father. A story has come down to us, whether true or not is not known, that Shakespeare's first attempt at poetry was a ballad at the expense of a certain Sir Thomas Lucy, whose deer park the poet with some companions had robbed. The angry squire had prosecuted him, hence the satirical ballad. This unfortunate piece of poetry only made matters worse, and is said to have caused him to run off to London. Here, according to one account, he was employed holding at the playhouse door the horses of those theatre-goers who came without their servants. However, we know nothing certain of this part of his life. But in 1592 we find a reference to him in Henry Chettle's pamphlet *Kind-Harts Dream*, which appeared in that year. Chettle speaks of him as "exelent in the qualitie he professes" — that is, acting — and praises his "uprightness of deeling" and "his facetious grace in writing." In spite, though, of Chettle's approval, it is certain that Shakespeare was not great as an actor. He did, indeed, have the pleasure of playing several times before Queen Elizabeth, whom he compliments in *Midsummer Night's Dream*. However, the great poet was not himself a mere dreamer. He soon became a theatrical shareholder, by 1597 was able to buy a home at Stratford, and in 1602 purchased a place of 107 acres near by.

WILLIAM SHAKESPEARE.

Probably about 1589–90, Shakespeare began his career as a playwright. Among his earliest comedies were *Love's Labour's Lost*, *The Comedy of Errors*, and *The Two Gentlemen of Verona;* among his earliest historical dramas were the second and third parts of *Henry VI.*, *King Richard III.*, and *King Richard II.;* the first romantic tragedy was *Romeo and Juliet*. The other two early plays *Titus and Andronicus* and the *First Part of Henry VI.*, were, it is thought, partly or wholly the work of other hands. This greatest of series of plays thus begun was ended by *King Henry VIII.* (1612–13), which critics think was written in part by Fletcher.

While writing, Shakespeare still continued to act; he is known to have played a part in Jonson's *Sejanus* in 1603 or 1604, but it is not known when he left the stage. Shakespeare died at Stratford-on-Avon, April 23, 1616, which is supposed to have been the anniversary of his birthday. See Morley's *English Literature*, and *Wm. Shakespeare, a Critical Study*, by George Brandes.

Shale, a variety of sedimentary rock formed from beds of mud or clay. The mud or clay was originally deposited in lakes or in the sea. Compacted by its own weight or by the weight of sediments laid down above it and cemented by mineral matter deposited from solution by the waters percolating through it, the mud or clay becomes shale. Shales are of various degrees of hardness, according to the degree of cementation, compression, etc. Some shale breaks up into slabs appropriate for the construction of walks. Such shale is *flagstone*. Shale occurs in rock systems of all ages later than Archean. (See GEOLOGY.) Soft shale is often ground up into clay for the manufacture of brick, tiles, etc. When subjected to compression, great enough to render it partially metamorphic, shale is converted into slate. If the process of metamorphism goes still further, shale may be converted into crystalline schist, such as mica schist.

Sha'ler, Nathaniel Southgate, American geologist and paleontologist, was born at Newport, Ky., Feb. 22, 1841, and graduated at the Lawrence Scientific school, Harvard, of which he is now dean and professor of geology, and since 1884 geologist in charge of the Atlantic division of the United States geological survey, and member of the National Academy of Sciences. For seven years (1873–80) he had charge of the geological survey of Kentucky, devoting part of each year to that work, and publishing many volumes as the result of his labors. His writings embrace: *Nature and Man in North America; Aspects of the Earth; The Story of Our Continent; Sea and Land; American Highways; A First Book in Geology; The Interpretation of Nature; Features of Coasts and Oceans; Illustrations of the Earth's Surface; Domesticated Animals, their Relations to Man; The Nature of Intellectual Property;* and *Kentucky*, in the "American Commonwealths" series.

Shamo'kin, Pa., a borough of Northumberland county, eastern central Pennsylvania, 20 miles south of Danville, Montour county, and 18 miles southeast of Sunbury, the county seat. It is on the Lehigh valley, the Northern Central, and the Philadelphia and Reading railroads, in the center of the great anthracite coal region. It contains a number of manufactories, machine shops, foundries, and other industries, and is a progressive town. Population 18,202.

Shamyl (*shäm'il*), **Samuel,** a Caucasian leader, was born in Daghestan, about 1797. He was a priest, and was active in uniting the Caucausian tribes against the Russians. He was elected "imam" or head of the Lesghians and was soon in absolute power over the tribes of Daghestan. The new modes of warfare he introduced were very successful, but the Russians hunted him from fortress to fortress, putting to death all their prisoners, in the hope of killing Shamyl. During the Crimean war, the allies supplied him with money and arms, but after the war ended the Russians renewed the attack more vigorously and in several months succeeded in surprising and capturing Shamyl after a desperate fight in which all but 47 of his 400 followers were killed. He was given a home in Central Russia and a pension of $5,000. He died at Medina, Arabia, March, 1871.

Shanghai (*shäng-hī'*), a city in central China, in the province of Kiangsu, and its most important seaport, is twelve miles from the mouth of the Yangtse-Kiang river. The Chinese part of the city has narrow, dirty streets, and is surrounded by a wall, with crowded suburbs. The French and English portions on the north of the Chinese city, parallel with the river, are well lighted and paved, with handsome houses and fine public buildings. The city is strongly fortified. Shanghai was opened to foreign commerce in 1842, and has a large trade with great Britain, Hong-Kong, India, and the United States, in silk, tea, cotton, rice, sugar, paper, hemp, wheat, oils, flower, and fruit seeds, fans, and medicines. About 2,900 vessels enter the port annually. Population 615,300.

Shan'non, the largest river of Ireland, rises in the Cuilcagh mountains and flows into the Atlantic ocean on the southwestern coast of Ireland. From Limerick to the sea, a distance of 70 miles, it forms an estuary or inlet, which is ten miles wide at the sea. Large vessels can reach Limerick, and smaller ones ascend as far as Athlone, while two canals connect the river with Dublin.

Shans, a group of tribes living on the borders of Burma, Siam, and China. They are descended from one of the original races of China, and have been pushed southward, entering the valley of the Irawadi about the 6th century. The shans and the Laos are the same people, and both are closely related to the Siamese. They are a lazy, gay people, fond of gambling and cock fighting, though not unwarlike. The women enjoy equal freedom with the men; slavery in a mild form exists, and serfdom is universal. Their religion is Buddhism. Their country is a succession of wide river valleys separated by ridges, with extensive forests of teak, with iron, rubies, silver, gold, copper, coal, and petroleum among its minerals. The trade of the country is largely in the hands of the Chinese, but the Siamese are noted for their chased work in gold and silver. The first important Shan state was the Mau kingdom, whose ruler conquered all Burma, and parts of Siam, and the Malay peninsula. Mau princes ruled until 1554, when most of the Shan states became tributary to the emperor of Pegu. In 1774–77, Siam conquered the

southern Shan states. The Shans governed by Siam are estimated at 2,000,000, but the numbers ruled by China, and of the independent tribes are unknown. The Shans, in the native territories of British India, number approximately 375,000. See *Among the Shans*, by Colquhoun; *Siam and Laos*, by Cheek.

Shark, the name for any member of a large group of cartilaginous fishes with external gill clefts. The sharks, rays, and skates are united into a large subclass of fishes called *Selachii*. The sharks have gill openings along the sides of the neck, while the rays and skates have them on the under surface of the expanded head. Sharks vary in size from the dogfishes (which see), about three feet long, to the large basking shark, 35 or 40 feet long. They are very voracious and destroy many fish. With four exceptions they are all carnivorous. They are more numerous in warm seas, but are widely distributed. The great white shark, which reaches a length of 25 feet, is the so-called man-eater shark. These animals are common in warm seas and occasionally wander to our coasts. They follow ships for great distances to obtain the refuse that is thrown overboard. The great blue shark, from 15 to 20 feet long, shares with the foregoing, the title of man-eater. Among the sharks found along the Atlantic coast of the United States are: the dogfish sharks, about 3 feet long; the sand sharks, about 6 feet long; the mackerel sharks, 8 to 15 feet long; the hammerhead sharks, 15 to 20 feet long; the small hammerheads, 3 to 5 feet long; the thresher sharks, about 20 feet long, and other sharks that appear occasionally. The sharks represent a very ancient family of fishes, with many clues to ancestral history. Their development is of special interest to naturalists. Their fin rays are used in China for making gelatine, their livers produce oil, and their rough skin, called shagreen, was formerly used in place of sandpaper.

WHITE SHARK.

Shaw, Henry W., an American humorist, was born at Lanesborough, Mass., in 1818. He began to publish his humorous sketches in 1863, under the name of "Josh Billings." They consist of quaint maxims, spelled by sound, and have been very popular. He was a favorite lecturer, and published four volumes of his sketches, and a yearly *Farmers' Allminax*. He died at Monterey, Cal., Oct. 14, 1885.

Shawl, an outer garment or outside wrap, which in its present form has been used for centuries. Cashmere shawls are made of the underwool of the cashmere goat of Tibet. The thread is very fine, selling at $10 a pound, and the colors used in dyeing are permanent, being mostly from native dyes. Some of the shawls are embroidered by hand, but many have the pattern woven into them. Three or four weavers work at one loom, with wooden needles instead of shuttles, and they work on the wrong side of the shawl, where the needles hang in rows. Five shawls are usually made in one year, at one loom, though some of the more elaborate take a year in the process of manufacture. The best cashmere shawls are very high priced, being often valued as high as $1,500 in India. The most beautiful shawls of Persia are made of silk. The manufacture of shawls has been extensively carried on in France, mainly at Paris, Lyons, and Nîmes, and also at Paisley, Scotland, and at Lowell, and other places, in the United States.

Shawnees', a tribe of American Indians, belonging to the Algonquin family, which first settled in New York, Pennsylvania, and Ohio, but were driven west by the Iroquois. They helped the French against the English, and in 1812 sided with the English against the United States. They moved to Missouri and Kansas, and to the Indian territory.

Shear'water, a class of ocean birds of the petrel family. They are brown birds, about a foot long, with webbed feet. They are night birds and spend most of their time in flight, but can swim easily. Their single white egg is laid in a hole in the ground. The sooty shearwater is found on the North Atlantic, but goes south for its breeding grounds. The great shearwater, Manx shearwater of Iceland and Greenland, and the dusky shearwater found at the Bermuda and Bahama islands, are other varieties.

Sheboygan (*she-boi'gan*), a city of Wisconsin, is a port on Lake Michigan, at the mouth of the Sheboygan river, and about fifty-three miles north of Milwaukee. It has a good harbor, and foundries, tanneries, breweries, and factories of shoes, chairs, and toys. Population 22,962.

Sheep, a group of quadrupeds, forming with the goats a natural sub-family. Wild sheep are natives of either mountainous regions or of high table-lands. They live in flocks, and take to flight at the call of their leader, on the approach of danger, though they can defend themselves when necessary. The ram can carry on a contest with a bull, and is always ready to attack a dog. The wild sheep have short wool, covered with long, straight hair.

SOUTHDOWN.

The great mountain sheep found in central Asia, with horns sometimes six feet long, and the Rocky mountain sheep, or bighorn of North America, are among the largest varieties of wild sheep. The common sheep has sprung from the wild animal, and was one of the first animals domesticated by man, as we read in Genesis that Abel was a "keeper of sheep." Their wool was early used in making cloth, the skin for writing on, the milk for a drink, and the flesh for food. They pasture on hilly ground, and thus can be profitably raised on land that is not well adapted to raising crops. The first sheep were introduced into the United States in 1609, and Merino sheep, now the principal variety, in 1801. The Merino sheep was brought from Spain, and owes its value to its fine, soft, silky wool. New York, Pennsylvania, Ohio, Texas, Missouri, California, Illinois, Indiana, Michigan, and Wisconsin, are among the states most largely engaged in sheep raising. The wool or fleece is usually cut off by hand, a shearer "clipping" from twenty-five to thirty sheep a day, but a sheep-shearing machine has been invented and is used in Australia. The Iceland sheep, with three, four, or even five horns, the broad-tailed sheep found in Asia, its tail weighing from 70 to 80 pounds, and carried often on a small carriage, and the Astrakhan and Circassian sheep, remarkable for their fine wool, are noted varieties.

Sheeps'head, a bony fish common along the Atlantic coast and regarded as one of our best food-fishes. They are distinguished by wide cutting teeth, in the front of their jaws, and by grinding teeth behind. Their food is hard-shelled animals, young oysters, other mollusks, barnacles, and the like. They vary in size from two pounds, in the south, to fifteen pounds in the north, but the average size taken is about seven pounds. They range from Cape Cod to Texas. The fresh-water drum and some other fishes are locally called sheepshead.

Shef'field, a manufacturing city of England, is situated in Yorkshire, where the Sheaf and Don rivers unite, thirty-eight miles south of Leeds. The town is well built, over $2,000,000 having been spent in street improvements in 1878. The Church of St. Peter, built in the reign of Henry I.; St. Mary's church, with a fine spire; Albert hall; Norfolk market, built by the duke of Norfolk at a cost of $200,000; music hall, and new town hall with a statue of Vulcan, are among the noticeable buildings. Wesley college, Firth college, Mechanic's institute, Athenæum, St. George's museum, founded by Ruskin, and the Mappin art gallery, are some of its institutions. Sheffield has long been noted for its cutlery, the "Sheffield whittle or knife," being spoken of by Chaucer. The Cutlers' company was founded in 1624, and the cutlers' annual feast dates from that time. The manufactures of the present day include brass, iron, and steel articles of every kind, and also armor plates, railroad springs, tires, and rails.

Sheffield from the Saxon times was the capital of a district belonging to a Norman family named Lovetot, who built a hospital, a mill, and a bridge over the Don. It passed by marriage to the Furnivals, and suffered in the wars of the barons, the castle being burned and many of the people slaughtered. During the Wars of the Roses, the Shrewsbury family, the ruling family of the country, sided with the house of Lancaster. The castle of the earls of Shrewsbury was a fortified building, covering four acres of ground, and here Queen Mary of Scotland was imprisoned for fourteen years. In 1644, the castle was taken by the army of parliament, and soon after torn down. In 1864, a reservoir gave way, with terrible effect; 250 lives were lost and millions of property destroyed. Population 364,243. See *Sheffield, Past and Present*, by Gatty; *Reminiscences of Old Sheffield*, by Leader.

Shel'drake, a large Old-World, salt-water duck of peculiar breeding habits. The common European sheldrake is about the size of a mallard and of brilliant plumage. The head and neck are green with a white collar, and a broad chestnut band below this, over the chest and back. The shoulders and middle of the under parts are black, the wing spot is green, and the bill and its knob are bright carmine. These birds breed in sand dunes, in chambers made by themselves or by rabbits. Nest-chambers, two or three feet deep, are made in a grassy hillock. Each nest-chamber is covered by a movable lid of sod. The nest-chambers are clustered and connected by galleries provided with a common entrance. Sometimes ten or twenty nest-chambers will be found in one group. Inhabitants of the sandy islands of the west coast of Jutland plunder these nests by removing the lid. All eggs above six in number are taken, and also the soft down with which the nests are lined. The sheldrakes of the United States are mergansers or fish-ducks, and belong to a distinct group.

Shell, the hard covering of an animal or an egg. While shells exist in great variety, those of the mollusks are the most typical — for example, those of the common snail and the common clam. These shells are secreted by gland cells in the outer covering of the animal. The outside of a clam shell is a horny layer, differing materially from the inside, which is always pearly. There is also a middle layer, forming a large part of the shell, and composed of regular prisms. The clam shell has, therefore, three distinct layers — outer, middle, and inner. The inner pearly layer is secreted by cells in the general surface of the mantle, while both the outer and middle layers are formed by cells in the thickened margin of the mantle. The substance of the shell is largely carbonate of lime,

but the outer layer is horny rather than limy. The immense variety of sea-shells are formed in a similar way, and the shells afford a means of identifying the animals that formed them. The shell or test of the sea-urchin is made of six-sided plates of carbonate of lime, secreted by the cells of the outer covering of the body. The shell of the lobster and the crayfish, although formed by a similar process, is, nevertheless, made of a horny substance called chitin. This is also the hard covering of beetles and other insects. The shells of eggs are formed by secreting cells within the walls of the oviduct or tube through which the egg passes before it is laid. The shell of the hen's egg has a deposit of carbonate of lime in it. Some minute animals (Radiolaria) have shells formed of quartz or silica, and some secrete a horny covering. The shells of mollusks have been used for money in South Pacific islands, for ornaments, jewelry, for making pearl buttons, etc. The study of shells is called Conchology. See Woodward's *A Manual of the Mollusca* (4th ed. 1880).

Shell, a hollow projectile, filled with powder, which is arranged to explode at the right moment, and which are fired from cannon or other large guns. Shells were at first made of cast iron and fired from mortars, and called bombs. Used first by the sultan of Gujarat in 1480, they were in general use by the middle of the 17th century. In 1842, Shrapnel shells, named after the inventor, were used in the Peninsular war. They are filled with bullets instead of powder, and a small charge, just enough to open them when set on fire by a slow match or fuse. Other shells were filled with pieces of iron and iron rings, but the Shrapnel shell is the one most used in warfare. It is especially a man-killing shell, while the common shell was used to destroy material. Carcasses are shells filled with some burning material which will set fire to buildings; hand grenades are small shells filled with gunpowder and exploded by a time-fuse, which are thrown by hand. See CANNON.

Shel'ley, Percy Bysshe, an English poet, was born Aug. 4, 1792, in Sussex, England, and studied at Eton and Oxford. At Eton he wrote two romances, and, with a fellow-student, published a volume of verse. While at Oxford with his friend, James Hogg, he published another volume of verse, and in 1811 a pamphlet on the *Necessity of Atheism*, for which the two friends were expelled from University college. These early poems are almost unknown now, and only show the erratic nature of the poet, whose mother, when a school was recommended to her as a place where a boy was taught to think for himself, exclaimed: "Think for himself! I only hope he can be taught to think as others do." At nineteen, he married Harriet Westbrook, a girl of sixteen, and lived in Edinburgh and Keswick, where he became a friend of Southey and DeQuincey, and a disciple of Godwin. His plans for reforming the world he started to carry out by scattering through Ireland his *Address to the Irish People*, and other pamphlets, and sending adrift in bottles and boxes his *Declaration of Rights*. His *Queen Mab*, written while living in Wales, where he had gone when his servant was imprisoned for nailing up in public places his *Declaration*, was at first privately distributed, because of its religious and political heresies. He left his wife in March, 1814, and in July, 1814, took a journey through France and Switzerland with Godwin's daughter Mary and a relative, Miss Clairmont. After his grandfather's death his income became fixed, and he retired to Bishopsgate, near Windsor Forest, where *Alastor* was written. His *Mont Blanc* and *Hymn to Intellectual Beauty* are records of his visit to Lake Geneva, where he met Byron. After the death of his wife he married Mary Godwin, and carried on a long suit to get possession of the children of the first marriage, but was allowed only to appoint their guardians and tutors. His *Revolt of Islam* was his last work in England, when he left for Italy in 1818. At Rome, Florence, Naples, Leghorn, and Pisa he spent the rest of his life, surrounded by a circle of friends, which included Byron, Trelawney, and Leigh Hunt, and wrote *Prometheus Unbound*, *The Cenci*, *Adonais*, and some of his finest lyrics, and in prose a *Defense of Poetry*. Among his most beautiful minor poems are *Ode to the West Wind*, *The Cloud*, *The Sensitive Plant*, and *The Skylark*. Shelley and his friend Williams were drowned in a sudden storm on the gulf of Spezia, July 8, 1822, and the ashes of his body, which was burned in the presence of Byron, Leigh Hunt, and Trelawney, were buried at Rome. See *Lives*, by Hogg, Rossetti, Sharp, and Lady Shelley.

Shenandoah (*shĕn'nă-dō'ă*), **Pa.,** a borough of Schuylkill county, in the heart of the anthracite coal region, on the Lehigh Valley, the Pennsylvania, and the Philadelphia and Reading railroads, 13 miles northeast of Pottsville, the county seat, and 84 northwest of Philadelphia. In the 15 colleries in the immediate neighborhood, a large number of miners are employed, which greatly aids the town. It has, besides a number of hat and cap factories and other industries, a brewery, several banks, good schools, churches, etc. Population 20,321.

Shenando'ah, a river in Virginia, draining the valley between the Blue Ridge and the Alleghenies and running northeast 170 miles to the Potomac, at Harper's Ferry. It passes through the richest part of Virginia, and was occupied by both armies, at different times, during the Civil war, and was the scene of numerous battles. See SHERIDAN.

Shere Ali (*shĕr ă'lē*), khan or amir of Afghanistan (1863–79), was born in 1825, the

son of Dost Mohammed, amir of Kabul (1826–63), under whom occurred the massacre of the English army in the Khyber Pass. Shere Ali died in Russian Turkestan, February, 1879. He had many vicissitudes as a ruler, from the rivalry of those who aspired to the Afghan throne, and from the intrigues of Russia, which sought to bring Afghanistan (or Afghan Turkestan) within the sphere of Russian influence. In 1866, he temporarily lost his throne, but regained it two years later. In 1870, the amir had trouble with his son Yakub Khan, heir apparent, who headed an insurrection, which Shere Ali suppressed, and confined Yakub a close prisoner in Kabul. Later on, Shere Ali welcomed a political mission from the tsar of Russia, but declined to receive an English embassy; this aroused the fear of England for its Indian frontiers. Negotiations were fruitless, and the English, pushing forward, occupied Jelalabad and Kandahar. At this, Shere Ali fled to Russian territory, but his son Yakub, now (1879) proclaimed khan, with his tribesmen, resisted the further advance of the British; but peace was declared at Gandamak on condition of the amir receiving a British resident at Kabul. This resident was treacherously slain, however, and a religious war was proclaimed. Kandahar now was garrisoned by British troops, and to relieve them Sir F. (now Lord) Roberts made his famous march to Kandahar, routed the Afghans, and installed the amir, Abdur Rahman (who died Oct. 1901), on the throne.

Sher'idan, Philip Henry, American general, was born at Albany, N. Y., March 6, 1831, his parents having arrived from Ireland a few weeks previous to his birth. Soon after his birth the family removed to Ohio, where his boyhood was spent. He was appointed a cadet at West Point, where he graduated in 1853 and was assigned to the 3d infantry as brevet second-lieutenant. When the Civil war broke out, he was a captain in the 13th infantry and was made quartermaster of the Federal army in Missouri. Seeking more active service he was assigned as colonel of the 2d Michigan cavalry, where he soon displayed the qualities which later won him worldwide fame. He was soon placed in command of a brigade and then of a division of the army of Ohio. He took part in the battle of Perryville, and won promotion to major-general by his brilliant service in the bloody battle of Stone river, Jan. 2 and 3, 1863, where his division lost over 1,600 men. He also distinguished himself at Missionary Ridge. When General Grant was placed at the head of all the armies, he gave Sheridan command of the cavalry of the army of the Potomac. Here he soon distinguished himself in the Wilderness campaign by his celebrated raid around the Confederate army, cutting their lines of communication, advancing nearly to Richmond, defeating the Confederate cavalry at Yellow Tavern, under their renowned leader, General Stuart, who was killed in the fight. In July of that year, when a strong Confederate force under General Early had defeated the Federal army in the Shenandoah valley, penetrating into Maryland and threatening Washington, General Grant saw the necessity of putting that department in the hands of an able general, and in August he placed Sheridan in command in the Shenandoah, with instructions to drive the Confederates out of the valley. Sheridan attacked Early at Winchester, and again at Fisher's Hill, defeating him at both points, capturing 5,000 prisoners and many guns, and pursued them to Stanton. In recognition of this service, he was made brigadier-general in the regular army. Early's army, receiving large re-enforcements from General Lee, again advanced into the valley, surprised the Federal army at Cedar Creek in the early morning of October 19, and drove them back in confusion. Sheridan, who had been called to headquarters at Washington, had reached Winchester on his return, when he heard the guns twenty miles away. Hurrying forward, he reached the field and met his troops retreating in confusion before the enemy. Speedily forming a line to stop stragglers, he rode forward waving his hat and shouting: "Face the other way, boys; we are going back." Confidence was restored, the lines were re-formed, and at 3 P. M. they moved back upon the enemy. The result was the total rout of Early's army, which was pursued up the valley for thirty miles. For this victory he was promoted to be major-general in the regular army, and received the thanks of congress. Returning to the army of the Potomac, in March, 1865, he was conspicuous under Grant in the operations before Petersburg, and in the final battles preceding Lee's surrender. It was his superior generalship at Five Forks, where he entrapped and routed the Confederate right under Pickett and Johnson, capturing 5,000 prisoners, which compelled the evacuation of Petersburg. After the close of the war, Sheridan was placed in command at New Orleans, and later of the department of the Missouri, with headquarters at Chicago. When Sherman was made general, Sheridan was made lieutenant-general, and when Sherman was retired, a special act of congress conferred the further rank of general upon Sheridan. As a field commander Sheridan was unapproachable. Filled with the ardor of battle, so that it was said he raged like a lion, yet his skill was equal to his

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courage. He never lost a battle; and stood, after Grant and Sherman, one of the greatest of northern generals. Grant said of him: "As a soldier there is no man living greater than Sheridan. He belongs to the very first rank of captains, not only of our army, but of the world. I rank him with Napoleon and Frederick, and the great commanders of history." Shortly before his death, at Nonquitt, Mass., Aug. 5, 1888, Sheridan wrote his *Personal Memoirs*, in two volumes.

Sher'idan, Richard Brinsley Butler, a British dramatist, was born at Dublin, Sept. 30, 1751. He made his first appearance in literature in a farce, called *Jupiter*, written in connection with a school friend. After marriage he settled in London and produced his first and most popular play, *The Rivals*, in 1775. *The School for Scandal* appeared at Drury Lane theatre, of which Sheridan had become owner, and brought prosperity to it by its popularity. He entered parliament, became undersecretary for foreign affairs in 1782, and secretary to the treasury in 1783. His high reputation as a speaker rests mainly on his three great speeches during the impeachment of Warren Hastings. His first speech produced such an effect in the house of commons that the house decided to adjourn without voting, because they were too much under the influence of the brilliant orator to vote impartially. He was in parliament thirty-two years, and was known as a strong speaker, but only equaled this first great speech in a magnificent oration in 1794 on the French Revolution. The Drury Lane theatre became too small, and a new one, built in 1794, was burned in 1809, which loss left Sheridan in great poverty. He died July 7, 1816, and was buried in Westminster Abbey. See *Life*, by Oliphant, in the "English Men of Letters" series; *Sheridan and His Times*, by Moore.

Sher'man, John, an American statesman, brother of General Sherman, was born at Lancaster, O., May 10, 1823. He was admitted to the bar in 1844, and in 1855–61 he was in congress as a representative from Ohio, and chairman of the committee of ways and means from 1860–61. He was elected United States senator in 1861, and continued to serve the state of Ohio in that capacity, except during the presidency of Hayes, when he was secretary of the treasury. In the Civil war, he raised a regiment in Ohio, largely at his own expense, and, as chairman of the committee on finance in the senate, helped to plan measures for sustaining the public credit. The bill for the reconstruction of the seceded states was the joint work of Thaddeus Stevens and John Sherman. He was appointed Secretary of State by President McKinley in 1897, but resigned because of failing health. Of much interest are his *Recollections of Forty Years in the House, Senate, and Cabinet*, published in 1895. He died Oct. 22, 1900. See *Life* by Bronson.

JOHN SHERMAN.

Sher'man, Roger, an American statesman, was born at Newton, Mass., April 19, 1721. He was a shoemaker by trade, then a surveyor of lands, and finally a lawyer and judge. He was in both the Continental and the United States congress from 1774 to 1791. He was of the committee that drafted the Declaration of Independence, was one of the signers of it, and was influential in having it ratified by the state convention of Connecticut, where he had resided since 1761. He died at New Haven, Conn., July 23, 1793.

Sher'man, Tex., a city, the capital of Grayson county, in a rich grain, cotton, and fruit-producing district in Northern Texas, sixty-one miles north of Dallas. It is well supplied by railways, and is an important shipping and manufacturing center. Its industries include a large cotton-seed oil mill, several foundries and machine shops, brick and marble works, planing mills, carriage, furniture, broom, and mattress factories, etc. Here are the Austin college for boys, the North Texas Female college, Sherman institute, the St. Joseph (R. C.) academy, and other institutions. Population 10,243.

Sher'man, William Tecum'seh, American general, was born at Lancaster, O., Feb. 8, 1820. He was the son of Judge Charles R. Sherman, who died in 1829, leaving his family in rather straitened circumstances. William was brought up in the family of Hon. Thomas Ewing, of Lancaster, where he attended the Lancaster academy. From there he went to West Point, where he graduated in 1840, standing sixth in a class of forty-three. He served as second lieutenant in the 3d artillery against the Seminole Indians in Florida in 1840 and 1841. After that, he was stationed at Ft. Moultrie, South Carolina, until 1846, when he was sent to California, where he served through the Mexican war and until 1850, having been made captain

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in 1848. He was married in 1850 to Ellen Boyle Ewing, the daughter of the Hon. Thomas Ewing. In 1853, he resigned his commission and became a partner in the banking house of Lucas, Turner and Co., of San Francisco. In 1858, he took up the practice of law in Leavenworth, Kan., but the next year became superintendent of the Military academy, at Alexandria, La. This position he held until Louisiana seceded in 1861, when he resigned, and coming north was appointed colonel of the 13th infantry in June, 1861. He commanded a brigade in the first battle of Bull Run, and for gallantry in this engagement was made brigadier-general of volunteers Aug. 3. He was next assigned to a command in Kentucky where, finding his small force entirely inadequate to meet the Confederate army under Breckinridge, which confronted him, he earnestly represented the situation to the secretary of war, stating that it would require 60,000 men to expel the Confederates from the Kentucky line, and 200,000 men to move offensively through to the Gulf, and clear the Mississippi valley. For this statement he was charged with being "crazy," but subsequent events proved that his judgment was sound. Sherman was next ordered to Paducah, Ky., and after the capture of Ft. Donelson, was put in command of the 5th division of Grant's army. In the battle of Shiloh, April 6, 1862, Sherman held the key to the position, and by his brilliant generalship saved the day. He was in the thickest of the fight, had three horses killed under him, and was twice wounded. Grant said, "Sherman, with raw troops, held the key to the Landing, and to his individual efforts I am indebted for the success of the battle." In recognition of this service he was made major-general of volunteers May 1, 1862. His next important service was in the operations connected with the siege and capture of Vicksburg. In command of the 15th corps, he went down the river from Memphis; the plan being that Sherman should attack Vicksburg, while Grant should move on Jackson. But the capture of Grant's supplies at Holly Springs brought him to a halt, and permitted the enemy to re-enforce Vicksburg. In the meantime, Sherman advanced on the city, which he assaulted Dec. 29, but found it impregnable to the force he had under him. A few days later, in connection with General McClernand, he stormed Arkansas Post, capturing 7,000 prisoners. In the subsequent battles in the campaign against Vicksburg, Sherman bore a conspicuous part. When Grant's rear was threatened by Gen. Joseph E. Johnston, Sherman was sent against him and captured Jackson, Miss., dispersing Johnston's army. When Grant was sent to succor Rosecrans, after the battle of Chickamauga, he called Sherman to his aid, and placed him in command of the army of the Tennessee. Here he took part in the battle of Missionary Ridge, where Bragg was defeated and driven into Georgia. He was next sent by Grant to the relief of Burnside, who was besieged by Longstreet at Knoxville. When Grant was called to the head of the army, Sherman was given command of the department of Mississippi, and of the three armies of Ohio, Cumberland, and Tennessee. On May 5, he began his great campaign against the Confederate army under Johnston, which ended in the capture of Atlanta, and which included the battles of Dalton, Resaca, New Hope Church, Kenesaw Mountain, and Peach Tree Creek. After the occupation of Atlanta, the Confederate army, under Hood, having moved westward, Sherman sent General Thomas back to Nashville to confront Hood, while with an army of 65,000 men, he began his famous "march to the sea," which was accomplished by the capture of Savannah, Dec. 21. On Feb. 1, 1865, he began his march northward through the Carolinas, closing with the surrender of Johnston's army, April 26, at Durham Station, North Carolina. On May 24, at the head of his magnificent army, which had just completed the march of nearly 2,000 miles in a hostile country, he passed in review before the President, General Grant, and thousands of spectators on Pennsylvania avenue, Washington.

After the war, General Sherman was appointed to the command of the second military division, with headquarters at St. Louis. When Grant was made general in 1866, Sherman was promoted to lieutenant-general in the regular army, and on Grant becoming President in 1869, Sherman was appointed general of the army of the United States. This position he held until, at his own request, Nov. 1, 1883, he was relieved and succeeded by General Sheridan. He died at New York, Feb. 14, 1891. General Sherman's qualities have thus been summed up by one well competent to judge: "Above all his other excellencies shone his promptitude, celerity, and immeasurable activity. What for some commanders were winter quarters were to him a bivouac. Always ready for the start, indefatigable on the march, omnipresent in battle, relentless in pursuit, General Sherman not only made himself more feared but more respected by the enemy than any general in the national armies save, perhaps, the one who commanded them all." In 1875, appeared *Memoirs of General W. T. Sherman, by Himself*.

Sher'ry. See WINE.

Sher'wood For'est, a stretch of hilly country in Nottinghamshire, England, about twenty-five miles long and from six to eight miles wide. It was formerly a royal forest, and is the scene of many of the exploits of the famous Robin Hood. It is almost entirely cleared now, and occupied by country seats and parks. See *Nottinghamshire and Sherwood Forest*, by White.

Shet'land, a group of islands north of Scotland and forming one of its counties. There are more than 100 of them, twenty-nine being inhabited. There are no trees and only one-sixth of the soil is cultivated, but the cliff scenery is very fine, and the coast so broken that no spot is more than three miles from the sea. The fisheries form the leading industry. The little shaggy Shetland ponies are well known. Shetland, the *Ultima Thule* of the ancients, belonged to Scandinavia until 1468, and the Norse language was still spoken in Foula in 1774. Area 550 square miles; population 30,000; chief town, Lerwick. See *The Pirate*, by Scott, and *Orkneys and Shetland*, by Tudor.

Shibboleth (*shib'bō-lĕth*), a word used by the Gileadites under Jephtha after their victory over the Ephraimites, to test the fugitives at the ford. The Ephraimites could not pronounce the "sh," and called it "sibboleth," and so were easily known. The word is still used in the sense of a test.

Shields, South, a town of England, is a seaport in Durham, at the mouth of the Tyne river, nine miles northeast of Newcastle-upon-Tyne. The coast is fine, with picturesque caves hollowed out in the cliffs. The south pier, a gigantic breakwater 5,218 feet long, was begun in 1854. The harbor is lined with ships and boat yards, iron, glass, alkali, and rope works, and paint and varnish factories. The Tyne docks also, which cover fifty acres, are near the town. The first lifeboat was built at South Shields and used first in 1790. The town was a military station in the time of the Romans; salt works were established as early as 1489, and glass works in 1619. Population 80,000.

Shill'aber, Benjamin Penhallow, American humorist, known by his pen name, "Mrs. Partington," was born at Portsmouth, N. H., July 12, 1814, and died at Chelsea, Mass., Nov. 25, 1890. Taking early in life to a printing office, he advanced from that to journalism, and was successively editor of the Boston *Post*, the *Saturday Evening Gazette*, and of a comic journal, *The Carpet-Bag*, to which John G. Saxe was a contributor. In 1854, he published *Life and Sayings of Mrs. Partington*, which gave him a wide reputation. This was followed by *The Partingtonian Patchwork;* by *Rhymes with Reason and Without;* by *Lives in Pleasant Places;* by *Ike and His Friends;* by *Cruises with Captain Bob;* by *Wide-Swath;* and by *Ike Partington's Juvenile Series.* He died at the age of seventy-six.

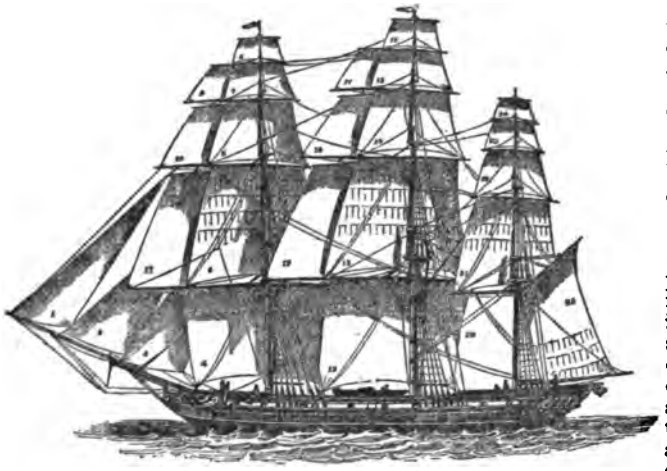
Shi'loh, a town of the tribe of Ephraim, the home of Eli and Samuel, and the religious center of Israel for many years. The site is now occupied by a ruinous village in Palestine, twenty miles northeast of Jerusalem.

Shi'loh, Battle of, one of the most desperate battles of the Civil war, named for a log meetinghouse, two miles from Pittsburg Landing on the Tennessee river. The battle between the Confederates under General Johnston, and the Federal army under Grant, lasted two days, on the first of which the Federals were driven steadily back, but regained the lost ground on the next day, when re-enforced by Buell's command. General Johnston was killed and the Confederates retreated, with nearly equal losses on both sides. The battle began Sunday, April 6, 1862, and is sometimes called the battle of Pittsburg Landing.

Shin'toism. See JAPAN.

Ship, the name given to most sea-going vessels, but usually applied to sailing vessels, those moved by steam being called steamers. The art of building vessels that could be moved on water is very ancient, beginning probably with the simplest forms, such as the canoe and raft, though Noah's ark was more elaborate, and what is remarkable, its proportions are those still considered the best for all purposes by shipbuilders. It was six times longer than its width, and three-fifths of its breadth deep. The nations living around the Mediterranean early learned the art of sailing on the ocean, building wooden vessels moved by oars, as the galleys and triremes, and using sails. Their ships in a storm were often bound outside with heavy ropes, or even with iron bands carried for the purpose, as the ship in Paul's voyage had to be "undergirded." The Scandinavians were early known as fearless sailors, and their warships were made stronger than the galleys used on the Mediterranean, as they had a fiercer ocean to sail over. The English navy was first made of importance by Alfred the Great, who introduced galleys with forty or sixty oars, to defend the coasts against the northern vikings. The crusades made necessary still larger ships and the use of sails, and the *Great Harry*, built by Henry VIII., is considered to be the first ship of the present English fleet. Spain, Portugal, Venice, and the Netherlands had large navies in the 15th century. The adventurous spirit which led to the discovery of America and the passage around the Cape of Good Hope increased the demand for improved sailing vessels, and France, Spain, Sweden, and Denmark were noted for their ships. The first ship built in the United States was the *Virginia*, at the mouth of the Kennebec river, in 1607, and shipbuilding soon became quite an industry in New England seaports. Their ships were original in plan, and built for special purpose, such as frigates for war vessels, schooners and sloops for coast service, whalers for the whale fishery, and the "clippers" for the China and India trade. The clipper ship, the *Great Republic*, was the

largest merchant vessel ever built, and many of them equaled in speed the steamships of the period. A ship, strictly speaking, has at least three masts with square sails. Brigs are smaller than ships, having two masts with square sails. Schooners have two or three



SAILS OF A FULL-RIGGED SHIP.

masts with a variety of sails; and a sloop has only one mast. The cutter is a form of the schooner, and the barkentine is a combination of the ship and the schooner. The introduction of iron and steel into shipbuilding, and the use of steam have changed the mode of building and the size and form of ships, though there is a tendency of late years to revert to sailing vessels. England has been the great shipbuilding country, but Germany, France, Italy, and America are increasing their production largely. See GALLEY, TRIREME, YACHT, STEAMBOAT, NAVY, etc. See *Shipbuilding Industry of the United States*, by Hall, and *Modern Shipbuilding and the Men Engaged in It*, by Pollock.

"Ship'ton, Mother" (Ursula Southiel), a famous English prophetess, was born in Yorkshire, in July, 1488. The earliest record of her prophecies is a pamphlet of 1641, in which she foretells the death of Lord Percy and Wolsey, saying that Wolsey should never reach York. As Wolsey was arrested at Cawood, a few days before his installation as archbishop of York, this prophecy is considered to have been fulfilled. A collection of ancient and modern prophesies in 1645 includes Mother Shipton's prophecies, and a comedy on the subject dates from about 1660. In 1862, a set of doggerel rhymes was circulated, purporting to be Mother Shipton's prophecies, in which it was foretold that the world would come to an end in 1881. It was really written by Charles Hindley. See *Mother Shipton Investigated*, by Harrison.

Shir'as, George, American jurist, and associate-justice of the United States supreme court, was born at Pittsburg, Pa., Jan. 26, 1832, and educated at the Ohio university, Athens, O. He subsequently graduated at Yale, studied law there, and was admitted to the bar in his native city, where he practiced with success until 1892, when he was appointed to succeed Judge Bradley as associate justice of the supreme court of the United States. On that appointment, he removed to Washington, D. C., of which city he is now a resident.

Shiraz (*shē'rāz*), a city of Persia, celebrated in Persian poetry for its climate, wine, roses, and beautiful gardens, is on a broad plain, 35 miles southwest of ancient Persepolis and 217 miles southeast of Ispahan. The walls are about four miles around and there were many fine mosques and other buildings until the earthquakes of 1812 and of 1824, which destroyed large parts of the city and 4,000 of its inhabitants. Another earthquake, in 1853, completed the destruction of the city and killed 10,000 people. The city has been rebuilt, and its wine, which resembles Tokay, is still famous. Rosewater is made in large quantities, and very fine inlaid work is produced. The city was a favorite resort of the Persian princes and was the home of the poets, Hafiz and Sádi, whose tombs are in the neighborhood. Population 50,000.

Shishak (*shī'shak*), the name of several kings of Egypt belonging to the 22d or "Bubastite" dynasty (10th century B. C.). The name of Shishak I., or Sheshouk I., is found on the porch of the great temple of Karnak and on several statues of a goddess, which probably came from Luxor. Jereboam, it is recorded in Kings, fled to Shishak when Solomon wished to kill him, and on his return became king of the new kingdom of Israel, which was formed by the ten tribes revolting from Rehoboam. Shishak marched against Rehoboam in the fifth year of his reign, and took Jerusalem and the treasures of the temple. This conquest of Jerusalem is recorded on the monuments of Karnak, where Shishak I. is represented as dragging before his god, Ammon, three rows of prisoners, marked with the names of such places as Judæa, Megiddo, and Ajalon.

Shoot. In the higher plants the main axis of the body grows in two directions. In general, that part of it which grows downward is the root, and that which grows upward is the shoot. In ferns and seed-plants the shoot for

the most part is differentiated into stem (often with branches) and leaves. In ordinary liverworts (as *Marchantia*), and in the sporophyte of mosses, the shoot is not so differentiated.

Sieve (*siv*) **Vessels** (in plants), often called "sieve tubes," the peculiar vessels characteristic of the bast or phloem portion of the vascular bundle. They are usually more or less elongated, and the name refers to the fact that their walls contain certain areas, known as "sieve plates," which are perforated by numerous openings, like the lid of a pepper-box. The sieve vessels are prominently associated with the transfer of food.

Short'hand or **Phonog'raphy** is a mode of writing which has been invented to enable one to write as rapidly as a man can speak. The first system of shorthand appeared in 1588, and since then nearly two hundred different systems have been published. The first system used a set of marks for words, instead of spelling them out with the letters of the alphabet. In 1602, appeared the *Art of Short Writing by Spelling Characterie*, by John Willis, which made use of signs for the letters of the alphabet. Isaac Pitman's system, called "phonography," was published in 1837, and is now largely used, though some improvements have been made in it. It has been adapted to the Japanese, French, Italian, German, Dutch, Spanish, Hindu, and Malagasay languages. It is based on the use of characters to represent the sounds of the English language instead of the letters. The characters used, curves, lines, dashes, etc., stand also not only for a sound but for words which occur very frequently, as the, and, it, etc., called letter-words or grammalogues. The marks also indicate the vowels by their position either on or above or below the line. The great use of shorthand is in reporting speeches. A speaker utters from 60 to 180 words a minute, or an average of 120 words a minute. A swift writer can make 180 separate strokes in a minute. Now by the use of shorthand it takes an average of one and one-third strokes to represent a word, so that a reporter can in this way take down 200 words in a minute. The various other systems now used are all based upon Pitman's. See *History of Shorthand*, by Pitman; *Shorthand Systems*, by Anderson.

Shoshone (*shō-shōn'e*) **Falls,** a cataract on the Snake river in southern Idaho. The river runs through a deep gorge, between walls of rock, 1,000 feet high. The head of the falls is in the shape of a semicircle, from which the water leaps 210 feet in a sheet 950 feet wide. Niagara Falls are less than 170 feet. The little Shoshone Falls are two cataracts separated by a great rock, with a fall of 182 feet, about four miles higher up the river.

Shosho'nes or **Snakes,** a family of American Indians, which includes the Utes, Comanches, and several other tribes. They have been known by various names, as Buffalo Eaters, Sheep Eaters, and White Knives. They were found by Lewis and Clarke beyond the Rocky Mountains in 1805. Their homes were in the valleys of Snake river, Humboldt river, and Great Salt lake. They have usually been peaceful, having little intercourse with the whites. From 1849 to 1862 there were battles and skirmishes with the advancing settlers, treaties made and broken by the government, until in 1867 they made peace at Fort Bridger, and were settled on reservations in Idaho, Wyoming, Nevada, and Utah. They number about 6,000.

Shot is the name given to all solid projectiles, *i. e.*, anything thrown out or fired from any kind of firearms. The shot used for cannon and machine guns are made of cast iron or steel and were formerly solid balls. Balls weighing more than three pounds are not now made solid. Bar shot were two discs of iron joined by a bar, used to destroy the rigging of a ship; chain shot used in the same way were two round shot fastened together by a chain. Canister or case shot is a tin cylinder filled with bullets. Grape shot was a number of small iron balls held together by canvas or iron plates, but is no longer used. Small shot used in hunting is made of lead in various sizes, from that of large peas to dust shot. The melted lead is dropped from a height through a colander into water. The lead falls in small drops through the holes of the colander, the shot varying with the size of the holes. The fall through the air cools and hardens the lead before it falls into the water. Shot towers are from 100 feet to 150 feet high; the highest shot tower is in Austria and is 249 feet high. The shot is sifted in sieves to separate the different sizes, imperfect ones being discovered by rolling them down an inclined plank, and are finally polished.

Showers of Fishes, a curious phenomenon most common in tropical regions. It is explained by a strong draft upward in the center of a whirling column of air, which sucks up the fish from the water and carries them through the air, dropping them at some distance from their homes. On the Isle of Mull, herrings fell on a hill 1,500 feet from the sea, and 500 feet above it. Sometimes the fishes are alive, but more often they are dead. Showers of frogs and of dead flies have also been noted.

COMMON SHREW.

Shrew, an insect-eating animal having the general appearance of a mouse, but belonging to quite a different order of animals. The

mice are gnawers, the shrews are insect-eaters and are related to the moles. They have a sharp, pointed snout and jaws with numerous, sharp teeth. They inhabit both the Old and New Worlds, living in fields and open woods. Besides insects, they eat worms and mollusks. Water shrews exist also in North America and in Europe.

Shrike, a song bird found in all parts of the world except South America. Shrikes, besides eating insects, prey upon field mice and small birds, capturing them with their bills and not with their talons. Owing to the weakness of their feet, their prey is impaled on thorns, and this habit has gained for shrikes the name of butcher birds. There are about two hundred species in all parts of the world, but only two in the United States. The great northern shrike, which is a winter visitor, is a little above ten inches long, gray above with a black and white tail and whitish undersurface with black bars. It nests in the Arctic circle, but is seen from October to April as far south as Virginia. The loggerhead shrike is common in the Mississippi valley, also through central New York to Vermont and Maine. It is about nine inches long and colored like the great northern shrike, except that there are no black bars on the breast. Its song is rather unmusical.

Shrimp, a name commonly applied to a number of small, slender, and long-tailed crustacea inhabiting salt water. The prawns are closely related and are commonly served in shrimp-salad. These animals are all small,

SHRIMP.

resembling in general form a lobster or crayfish. Some are nearly transparent. They live on the sand in salt water. They are taken in great numbers for food, especially in England and in France.

Shu'brick, William Branford, an American naval officer, was born at Charleston, S. C., Oct. 31, 1790. He entered the navy in 1806. In the War of 1812 he aided in the defense of Norfolk; and in 1813, on the *Constitution*, he helped to capture three ships of war, taking command of one of them, the *Levant*. In 1838, he was head of a squadron in the West Indies, and in 1847 of one in the Pacific, where he captured Mazatlan, on the gulf of California, helping to establish the government of the United States in California. He had command in the Paraguay expedition in 1859. He retired in 1862 with the rank of rear-admiral, and died at Washington, D. C., May 27, 1874.

Shu'feldt, Robert Wilson, an officer of the United States navy, was born at Red Hook, N. Y., in 1822. He entered the navy, rising to the rank of commander in 1853, when he resigned. In the Civil war he was commander of the steamship *Conemaugh*, at Charleston, S. C., and took part in the battles of Morris Island. In 1870, he became commander of the monitor *Miantonomah*, and later had charge of a surveying expedition to Nicaragua. He left the service in 1884, with the rank of rear-admiral, and died Nov. 7, 1895.

Siam (*si-am'*), **Gulf of,** an arm of the China sea, south of Siam and west of Cochin China. It is 245 miles wide at its entrance, and extends inland for 390 miles.

Siam', Kingdom of, in the Indo-China peninsula, is a country whose limits have varied much at different periods of its history, most of the border lands being occupied by tribes more or less independent. By the treaty of September, 1893, the river Mekong was made the boundary between Siam and the French possessions; but in January, 1896, the British and French governments came to an agreement by which France appropriated the territory of 100,000 square miles lying between the Mekong and the Annam hills, thus leaving to Siam a territory of 200,000 square miles. The plain of the Menam valley and the Korat tableland, from 400 to 1,000 feet high, form the larger part of the country. The Menam, 600 miles long, is the principal river, and the Mekhong or Cambodia river is partly within the territory, but is of little use for navigation, being obstructed by falls and rapids. Gold has been found in Siam from the earliest ages, and the mines are now being worked by European speculators; copper, tin, iron, rubies, and sapphires are also found. The animals are those of the tropical regions, the elephant being tamed and used for labor in the teak forests. Some of the famous white elephants are kept in the royal courtyard at Bangkok, but are not held sacred, or fed on golden dishes, according to the stories. The climate is healthy, with two seasons, the wet and the dry, and a rainfall of 54 inches. April is the hottest month of the year. The population numbers 5,000,000, of which about one-third are pure Siamese. There are 3,500,000 Chinese, besides Burmese, Malays, Cambodians, and the Laos, or Shans. The Siamese are small, well shaped, olive colored, with black hair. They are peaceful, vain, social, and lazy, very fond of bright colors and jewelry. The children's heads are shaved, except a tuft on the crown, which is cut off with great ceremony when they are grown. Their houses are built of wood, thatched with palm leaves, and stand on piles. The banks

of the rivers are often lined with wooden houses floating on rafts or bundles of bamboo. The food of the country is mainly rice, fish, and fruit, and a liquor made from rice is used as a drink, but there is very little drunkenness. Betelnut chewing and tobacco smoking are almost universal, the teeth being colored black by the nut and other materials used for the purpose. The Laos or Shans are closely related to the Siamese, about 2,000,000 of them being under the rule of Siam, while other tribes are subject to China. The religion of Siam is Buddhism, and all the Siamese enter the priesthood for a time. The temples are numerous, with gilded minarets, roofs of colored tiles, and quaint pagodas. Siam is governed by a king, the present ruler, being Chulalongkorn I., who succeeded to the throne in 1868. He is anxious to improve his country, and is interested in the introduction of railroads and telegraph lines, and through his influence Siam joined the postal union in 1885, and has an electric light company to light the streets of Bangkok, while education is making distinct progress. In the capital alone there are nearly eighty government and aided schools, and these, together with the schools in the provinces, are under the control of an English chief-inspector. The Government has spent $5,000,000 on railway construction, and telegraph lines have been completed to the length of 1,820 miles. The chief production of the country is rice, with tobacco, coffee, hemp, cotton, and tropical fruits. Manufactures are not developed; only coarse cloth and silk, rough paper and water jars and tiles are made in the country. The cutting of teak, an important industry, is almost entirely in the hands of the British.

Siamese history begins with the year 1350. Cambodia was conquered and made tributary in 1532, and the present dynasty was founded in 1782. Ayuthia was the capital until it was burnt by the Burmese after a siege of two years in 1768. Bangkok (population 250,000) was made the capital by a general named Phya Tak, who drove the Burmese from the country and became king. See *Siam, the Heart of Farther India*, by Coit; *A Thousand Miles on an Elephant*, by Hallett; and *The Land of the White Elephant*, by F. Vincent.

Siamese' Twins, the name of two children, Eng and Chang, born in Siam in 1811. They were united by a band of flesh growing from chest to chest. They were shown as curiosities in the principal cities of Europe and America, and finally settled in North Carolina, where they married two sisters. The Civil war ruined them financially, and they again made the tour of Europe, exhibiting themselves in 1869. They died in North Carolina, two hours and a half apart, Jan. 17, 1874.

Siberia (*sī-bē'ri-ā*), a large territory belonging to Russia in northern Asia. It covers 4,833,500 square miles, stretching from the Chinese empire to the Arctic ocean. A large part of the region is only imperfectly known. It is, however, covered with a network of highlands and mountain ridges of which the Great Altai and Sayan mountains, separating Siberia from Mongolia; the Barguzin and South Muya ridges, with others still unnamed; the Stanovoi mountains, which form a high wall on the coast of the Sea of Okhotsk, are the most important. Some of the peaks of the Altai mountains and a few others rise into the region of perpetual snow. A belt of forests on the northwestern border of the central plain, and beyond that another belt of high plains, 500 miles wide, 1,700 feet to 2,500 feet high, and most of it very fertile, end in an immense lowland stretching to the shores of the Arctic ocean. These lands in western Siberia are very fertile, and are now the granary of Siberia, and contain one-third of the population. Between the Obi and the Irtysh are great marshes, which can be crossed only when frozen, and farther north still, the "tundras" (salt prairies and frozen swamps), where the ground is frozen hundreds of feet deep, and thaws only on its surface in the summer. Trees disappear, only a few low bushes and a few flowering plants surviving the cold. Yet some 50,000 human beings call this region home, and wander over it with sledges drawn by reindeer and dogs. In the southeastern part of Siberia, in the Amur province, are high plains, covered with oak forests, and rapidly filling with emigrants from Russia; while there are fertile tracts on the frontier of Korea, and a splendid harbor at Vladivostok, on the gulf of Peter the Great. The large rivers of Siberia — the Obi, Yenesei, Irtysh, Lena, and Amur, being some of them — assist greatly in the interior communication of this great country, and four lines of railroad have already entered Siberia on the west, one of which, the trans-Siberian line, opened in 1899, established uninterrupted steam communication through the Russian empire. Siberia is the coldest country in the world, and yet the summers are much warmer than is usually supposed, and melons are grown in the open air in some parts, and barley sown in May will ripen by August. The summers, however, are short, and by November all the rivers are frozen, and in the extreme north the thermometer has recorded 75° and 85° below zero. The air is very dry and there is no wind, which makes the cold more endurable.

The native tribes of Siberia, almost exterminated by their various conquerors, number hardly 700,000, and with about 3,000 Koreans, and 15,000 Manchurians and Chinese, added to the Russians, make up the population of 5,727,090, which is increased yearly by about 50,000 Russian immigrants. The Russians belong to the Greek church; the Turkish tribes are Mohammedans; while others are Buddhists. The exiles who are sent to Siberia from Russia at the rate of 20,000 a year, add but little to the population. They are

worn out by the hard two years' journey on foot, and a number of years' imprisonment, and those who survive, looking upon Russia as their home, perish, many of them, in their vain efforts to return. Siberia is very rich in minerals, but mining is still undeveloped; gold, silver, lead, copper, and iron, are mined, however, in considerable quantities, and a profitable trade in timber is carried on. The chief occupations are farming and cattle breeding, while hunting is profitable for the valuable furs of the sable, ermine, gray and white foxes; and fishing is carried on extensively. There are 339 schools, supported in the main by local authorities, with 773 teachers and an attendance of 43,786 pupils.

The earliest inhabitants of Siberia are called by some writers Yeniseians, who were followed by a race of considerable skill, judging from their relics found in mounds. The Turks conquered the country in the 11th century, and were conquered themselves by the Mongols two centuries later. The Russians invaded the region first in 1580, by a band of Cossack robbers, followed for two centuries by other bands of Cossacks, traders, and hunters, dissenters flying from religious persecution, and peasants escaping from serfdom. In the first eighty years the Cossacks had reached the sea of Okhotsk, but Russia's possession was not acknowledged by China before 1857. Bering strait was discovered in 1648 by the Cossack Dejnef, who sailed around the northeastern end of Asia; but as his discovery was not made known, the honor still belongs to Bering. In 1878–79, Nordenskjöld sailed through the Arctic ocean, Bering strait, China sea, Indian ocean, and Suez canal, and returned to Sweden, thus going entirely around Asia for the first time. See *Through Siberia*, by Lansdell; *Tent Life in Siberia*, and *Siberia and the Exile System*, by Kennan.

Sibyl (*sib'il*), a name given to certain inspired prophetesses in the mythical period. Their number varies, but is generally fixed at ten, of whom the most celebrated was the Cumæan, who is mentioned in the sixth book of the *Æneid* as leading Virgil into the lower world. According to Livy she came from the east to King Tarquin, offering him nine books of prophecies, but at such an enormous price that he refused to buy. She then destroyed three, and, returning, offered the remaining six at the same price, and was again refused; destroying still another three, she asked as much for the three left, which Tarquin's curiosity finally induced him to buy. They contained advices regarding the religion and government of the Romans, and were carefully guarded in the temple of Jupiter until 83 B. C., when the temple was burned. A new collection was made of about 1,000 lines, gathered from all the cities of Greece, Italy, and Asia Minor, which was kept until some time between 404 and 408, when it was publicly burned. The Sibylline oracles, written in Greek, in 14 books, containing 4,000 lines, are entirely distinct, being a series of pretended prophecies written by Alexandrine Jews and Christians.

Sicil'ian Ves'pers, the name given to the massacre of the French in Sicily, March 30, 1282, the first stroke of the vesper bell being the signal for slaughter. Charles of Anjou, brother of Louis IX. of France, had conquered Naples and Sicily, but was hated by his Sicilian subjects for his cruelty and injustice. The inhabitants of Palermo at that signal rose against their French oppressors, killing men, women, and children to the number of 8,000, an example followed throughout the island, where the French were hunted like wild beasts. The 600th anniversary of the Sicilian Vespers was celebrated in 1882. See *The War of the Sicilian Vespers*, by Amari, translated by the earl of Ellesmere.

Sic'ily, the largest island in the Mediterranean sea, is also the most populous and the most fertile. It lies off the coast of Italy, separated from it by the strait of Messina, two miles wide. It covers 9,936 square miles and is shaped like a triangle. Sicily is a plain, 500 to 1,900 feet above the sea, crossed in the northern part by a chain of mountains, the loftiest peak being 6,467 feet high. From the center of the chain a range branches off, going through the heart of the island to the southeast. The lower mountain slopes are usually covered with groves of oranges and olives, and the plain with fields of wheat. Mt. Etna rises from the vine-clad plain of Catania, 10,850 feet, with a base of 400 square miles. The climate is warm except in the mountain regions. Magnificent forests of oak, ilex, beeches, chestnuts, and pine are still found, though many have been recklessly destroyed. Dates, figs, almonds, lemons, olives, pomegranates, and grapes are very abundant. The wheat of Sicily is one-seventh that of all Italy, and the barley one-half of the crop of the kingdom. It manufactures two-thirds of the wine of Italy, and exports a large amount of sumac for tanning. The only mineral product obtained on the island is sulphur, of which there are some 300 mines. The sardine fisheries employ a large number of persons, but manufactures are few—mainly cement, crockery, gloves, macaroni, and soap. The population numbers 3,682,766. The people are devout but superstitious, and three-fourths of them cannot read. Elementary education is compulsory, however, for children between six and nine years of age, and though this law is by no means strictly enforced, school attendance is steadily increasing.

There were early Phœnician settlements in Sicily, but the real settlers were Greek colonists who founded cities on the east and south coasts, from 735 to 579 B. C. The first struggle with Carthage, which ended for seventy years by

the great victory at Himera over Hamilcar, in 480, was followed by a Phœnician invasion under Hannibal, but Dionysius the Tyrant checked the Carthaginian conquests; in 210 B. C. the island became a Roman province, was conquered by the Vandals in 440 A. D., ceded to Theodoric, and regained by Belisarius (535). The Saracen occupation, dating from 827, lasted until the Normans took possession in a series of struggles lasting from 1038 to 1090. The Norman, Roger, count of Sicily, in 1130 took the title of "King of Sicily and Italy." In 1194, the crown went by marriage to the German emperor, until 1264, when the pope, Urban IV., a Frenchman, gave Sicily to Charles, count of Anjou. Manfred, the last German ruler, died fighting against the invader, and his son-in-law, Peter of Aragon, continued, the contest, ending with the crowning of his son, Frederick, in 1296. The contests of France and Spain for Sicily and Italy continued, and in 1502, Ferdinand of Aragon defeated the French at Mola, and became king of Naples and Sicily. The peace of Utrecht (1713) gave Sicily to the duke of Savoy, who in 1720 exchanged it with Charles VI. of Austria for Sardinia, but in 1738 Don Carlos, of Spain, was king of the two Sicilies. The Bonaparte rule began with the taking of Naples in 1798, lasting until 1808, when Ferdinand IV. was allowed to remain king of Sicily, afterward taking by the treaty of Paris his old kingdom of the two Sicilies. At last, on May 11, 1860, Garibaldi, with his thousand heroes, took Palermo, and entered Naples in triumph, and the people of Sicily and Naples by a popular vote joined themselves to the Sardinian kingdom. The chief cities of Sicily are Palermo (population 292,799), Messina (population 156,552), and Catania (population 134,680).

THE TWO SICILIES, a kingdom of southern Italy, included the island of Sicily, several smaller islands, and the kingdom of Naples. See *History of Sicily*, by Freeman; and his shorter history in the "Story of the Nations" series.

Sick'les, Daniel Edgar, an American general, was born at New York, Oct. 20, 1825. In 1847, he was sent to the state legislature, and in 1853 went to England as secretary of legation, and became a member of congress in 1856. When the Civil war broke out, he was made colonel of a regiment he had raised in New York, and as brigadier-general commanded in the battles of Chickahominy. At Antietam and Fredericksburg he commanded Hooker's division of the 3d corps, and with the rank of major-general served at the head of the 3d corps at the battles of Chancellorsville and Gettysburg, losing a leg in the fight. After the war, he was commander of the military district of North and South Carolina until 1867, and in 1869 was appointed minister to Spain. In 1892, he was elected to congress from New York city.

GEN. D. E. SICKLES.

Sidd'ons, Sarah, the great tragic actress of England, was born at Brecon, Wales, July 5, 1755. Her father, Robert Kemble, was the manager of a small traveling theatrical company, and she took part in the performances of the company from her earliest childhood, and, at seventeen, married Siddons, a member of the company. Her first appearance at Drury Lane, Dec. 29, 1775, in the character of "Portia" was a failure, and for six years her acting was confined to the provinces. In 1782, she reappeared in London as "Isabella" in the *Fatal Marriage*, and was the queen of the English stage from that time until, as "Lady Macbeth," she took leave of it, June 29, 1812. She gave public readings from Shakespeare and Milton, and appeared occasionally for charitable objects, after leaving the stage. She died at London, June 8, 1831. See *Life*, by Mrs. Kennard, in the "Eminent Women" series.

Sid'ney, Alger'non, was born in Kent, England, in 1622. He commanded a troop of horse in Ireland when his father was lord lieutenant, and in 1644, having declared for the parliament, he was given a command under the earl of Manchester, and was wounded at Marston Moor. In 1645, he was returned to parliament, and in 1646 he became governor of Dublin, his brother being lord lieutenant of Ireland, and afterward was made governor of Dover by the house of commons. Though one of the commissioners, he took no part in the trial of the king, yet called it "the justest and bravest action ever done in England." He was one of the council of state, and spent twelve months in Denmark and Sweden on a political mission. While in retirement in France, he was accused of intriguing with Louis XIV. against both Charles II. and William of Orange. He drew up the constitution of Pennsylvania for his friend William Penn, including in it universal suffrage and religious equality. In June, 1683, he was charged with a share in the Ryehouse plot, and on no evidence but that of the traitor Lord Howard, and his own writings, he was condemned and executed Dec. 7, 1683. His *Discourses Concerning Government* were first published in 1698. See *Lives*, by Headley and Ewald.

Sid'ney, Sir **Philip,** an English courtier and writer, was born Nov. 29, 1554, at Penshurst, in Kent, England. He studied at Oxford, finishing his education, after the fashion of the day, by traveling in France, Germany, and Italy. His uncle Leicester being all-powerful at the court of Elizabeth, Sidney

began at once his public life. He was sent as ambassador to Rudolph II., of Austria, and then to William, prince of Orange. At first a favorite of the queen, he lost her influence by his defense of his father against her ingratitude, and by his opposition to her proposed marriage with the duke of Anjou. In 1580, he retired from court, living with his sister, Lady Pembroke, where he probably wrote his *Arcadia*. His associations with Spenser, and perhaps the circulation of his writings in manuscript, had already given him a wide reputation, which was well sustained by his *Arcadia*, written in 1578–80, which appeared in 1590, and for a century retained its great popularity. It is a pastoral romance, written in poetical prose, and while not free from the "conceits" of the age, is still well worth reading. His *Apology for Poetry* (*Defense of Poesy*), written about 1580, displays his vast reading, and while criticising severely the crowd of common versifiers, names as the best English poets, Chaucer, Sackville, Surrey, and his friend, Spenser. His own poems, *Astrophel and Stella*, a series of 108 sonnets and 11 songs, were inspired by his love for Penelope, a daughter of Lord Essex, and place him next to Chaucer in the long line of English poets. He returned to court, was knighted, and in 1583 received from Elizabeth a grant of 30,000,000 acres in "certain parts of America not yet discovered," and planned to accompany Drake to America. He was ordered, however, to go with Leicester to the Netherlands, where after a brilliant exploit in a chivalrous conflict, he was fatally wounded under the walls of Zutphen, Oct. 2, 1586. Faint from the loss of blood, he called for a drink, but seeing a poor soldier carried by, looking longingly at the water, he handed the cup to him, saying "Thy necessity is greater than mine." See *Life*, by Symonds, in the "English Men of Letters" series.

Si'don, an ancient city of Phœnicia, on the east coast of the Mediterranean, about half way between Tyre and Beyrout. It held the first position among the cities of Phœnicia, so that it sometimes gave its name to the whole region. Its colonies were found throughout the whole ancient world, and its commerce was very large. Its manufactures of linen, glass, purple dyes, and perfumes were sources of great wealth. Even under Assyrian, Chaldean, and Persian rule, it retained its importance, reaching its highest prosperity under the Persians. An unsuccessful revolt in 351 B. C. involved it in temporary ruin, from which it recovered speedily. In 333 B. C., Alexander the Great conquered it, and it fell in succession into the hands of Syrians, Greeks, and Romans, and in the middle ages was taken by crusaders. The present town, called Saida, has 10,000 inhabitants.

Siemens (*sē'menz*), **Ernest Werner von,** a German electrician, was born at Hanover, Dec. 13, 1816. In 1831, he took out his first patent for galvanic silver and gold plating. His work in connection with the telegraphic system of Prussia resulted in the discovery of the powers of gutta-percha in insulating underground and marine cables. He is known as one of the discoverers of the self-acting dynamo. With his brothers he established large houses for the making of electrical apparatus in Berlin, St. Petersburg, London, Vienna, and Tiflis, and in 1892 in Chicago. His scientific papers were collected and published in 1881. He was one of the foremost electricians of the day, sharing with his brothers in many inventions. He died at Berlin, Dec. 6, 1892.

Sie'mens, Sir **William,** the German scientist, was born near Hanover, April 4, 1823. He studied at Göttingen, giving special attention to science. After two visits to England in the interests of his brother's inventions, he made England his home in 1844, and became a British subject in 1859. As manager of the house of Siemens Brothers, he was engaged in constructing telegraph lines, the steamship *Faraday* being designed by him for cable laying. He also built electric railroads. The principle of his "regenerative" furnace has been applied in many ways, but especially by himself in the manufacture of steel. He invented a water meter, a bathometer for measuring ocean depths, an electrical thermometer, and a process of hastening the growth of plants by electric light. In 1874, the royal Albert medal, and in 1875 the Bessemer medal were given him in recognition of his inventions. He was president of the three principal telegraphic societies of Great Britain, of the British association, and in 1883 was knighted. He died at London, Nov. 19, 1883. See *Life*, by Pole.

Siena (*sē-ā'nȧ*), a city of Italy in the center of Tuscany, about sixty miles south of Florence. It is a walled city, with narrow, winding streets. The cathedral, begun in the 13th century, is one of the finest Gothic churches in Italy, with a wonderful eight-sided pulpit, a fine mosaic floor, a series of frescos of scenes in the life of Pope Pius II., and a font with bas-reliefs by Donatello and other sculptors. The church of St. Catherine, the fountain of Fontebranda, celebrated by Dante, the palace and its high tower, the university, founded in 1300, and the Institute of Fine Arts, are among the attractions of the place. There are manufactures of silk, cloth, and hats, and a trade in wine and olive oil. Siena, a Roman colony, became a free republic at the breaking up of the empire and was the head of the Ghibelline towns in central Italy, being a rival of Florence. In 1399, to protect themselves from Florence, the Sienese placed themselves under the duke of Milan, and in 1524, to escape the usurpations of the Petrucci family, they became tributary to the Emperor Charles V., who afterward gave

Siena to Cosmo de Medici, and it became a part of Tuscany. It is the seat of one of the 21 universities of Italy, with (1901) 31 professors, and 231 students. Population 31,367.

Sienkiewicz (*syen-kye'vich*), **Henryk**, Polish novelist, was born at Wola Okrzejska, in Lithuania, in 1846, and was educated at the University of Warsaw. Early in his career, having espoused journalism, he devoted himself to literature, and soon won a high position as a novelist and short story writer. In 1876, he came to the United States, and for a time, in company with Madame Modjeska, his countrywoman, he resided in California, where he designed to establish a Polish colony. In 1880, he wrote a work on *Tartar Slavery*, following this, a few years later, by his masterly novel, *With Fire and Sword*. To this succeeded *The Deluge*, *Pan Michael*, *Without Dogma*, and *Children of the Soil* —all of them remarkable for their vigor of characterization, historical truth, and power of psychological analysis. Meanwhile he had returned to Poland, and from there traveled considerably about the Old World, studying types of character and steeping his imagination in the scenes and histories of various peoples. Patriotic ardor and love of his country reveal themselves chiefly, however, in his works. In 1895, appeared his masterpiece, *Quo Vadis?* —a tale of the time of Nero, written with remarkable vigor and powerful effect. Of his short stories, the best are those that deal with Polish scenes and people. Most of his novels have appeared in American editions, translated by Jeremiah Curtin, and published at Boston.

Sierra Leone (*sĭ-ĕr'ra lē-ō'nē*), a British colony on the west coast of Africa, founded in 1807, and situate southeast of French Guinea. It lies north of Liberia, with 180 miles of coast line, and, stretching toward the interior, covers about 4,000 square miles. The name is sometimes confined to the peninsula south of the Sierra Leone inlet, which is twenty-six miles long, rising to 3,000 feet in Sugar Loaf mountain. The climate of the region is hot and moist, and the lowlands malarious, giving it the name of the "White Man's Grave." The people, numbering about 75,000, are nearly all negroes. Agriculture and trading occupy about one-fifth of the population, but the resources of the country are not fully developed. Coffee, cocoa, tapioca, ginger, maize, and cotton are grown, and there is a little boat building, mat making, and cloth weaving. The capital, Freetown, the most important seaport in West Africa, is a fortified naval depot, and a coaling station. There is a university, founded by the Church Missionary society, a savings bank, a lunatic asylum, and sixty-five schools, with an average attendance of 5,583 pupils. Sierra Leone (Lion mountain) was discovered by Cintra, a Portuguese navigator, in 1462, and so named from the heavy thunder roaring on its mountains. Two attempts have been made to colonize it with freed slaves, in 1787 and 1791; the second effort being made under the Sierra Leone company and supported by the arrival of 1,200 freed slaves from North America. In 1807, it was ceded by the company to the British crown. A railroad from Freetown to to Songstown (32 miles) was opened in 1899. See *Sierra Leone*, by Banbury.

Sier'ra Madre (*mä'dra*), meaning "main chain," a range of mountains in Mexico, stretching north into Arizona. The name sometimes includes the Cordilleras.

Sier'ra Morena (*mō-rā'nä*), a mountain ridge in the south of Spain, ranging from 2,000 to 5,500 feet in height. It has valuable mines of lead, silver, lignite, and quicksilver; and is the scene of many of the incidents in *Don Quixote*.

Sier'ra Nevada (*nē-vä'dä*), "snowy range," a mountain range in southern Spain, crossing the province of Granada, about sixty miles long; Mulahacen, 11,600 feet high, is the highest point of the Spanish peninsula.

Sier'ra Neva'da, a range of mountains in California 450 miles long, merging into the Coast Range. Mt. Whitney (14,886), Mt. Shasta (14,440), and Mt. Tyndall (14,386), are the highest peaks. The mountains are covered with forests, and gold and silver are found there in large quantities.

Sier'ra Neva'da, the name of two ranges in South America, both thought to be parts of the Andes range. The mountains are wooded on the northern slopes, and naked rocks tower 6,300 feet on the southern side. Copper, silver, gold, and coal are found. The highest peaks are from 15,000 to 17,500 feet high.

Sieyes (*sē-ā yās'*), **Emanuel Joseph**, Count, known as the Abbé Sieyès, a prominent figure in the French Revolution, was born at Fréjus, France, May 3, 1748. Entering the church, on account of his health, he became a canon and then chancellor and vicar-general. At the beginning of the struggles for liberty in France, he published three pamphlets on political questions. In the third one, *What is the Third Estate?* (the representative body of the French people) he gave the celebrated answer "Everything; What has it been? Nothing; What does it desire to be? Something." This pamphlet made his name famous throughout France. He was elected a deputy in Paris, and it was on his motion that when the nobles and clergy refused to join the deputies of the people, they declared themselves the National Assembly. The division of France into departments and the celebrated declaration of the "Rights of Man," were mainly his work. He voted for the king's death, but was opposed to a republic, and to the excesses of the revolution. Sent to Ber-

lin, he secured the neutrality of Prussia. With Bonaparte he plotted the revolution of the 18th Brumaire (Nov. 9, 1799), ending in the consulate of Sieyès, Bonaparte, and Ducos. His new ally, however, proved a master, and he resigned his consulship in disgust, though to propitiate him he was given the title of count, an estate, and $120,000. He lived in Belgium during the restoration, dying at Paris, June 20, 1836. See *History of the French Revolution*, by Lamartine.

Sigel (*sē'gel*), **Franz,** an American general, was born in Germany in 1824. He was in the service of the grand-duke of Baden, and became minister of war in the revolution of 1848, but was obliged to flee, and came to the United States. He entered the army as colonel in 1861, during the Civil war, and by gallant service rose to the rank of major-general. He was elected register of New York city in 1871, and appointed United States pension agent for the city in 1885.

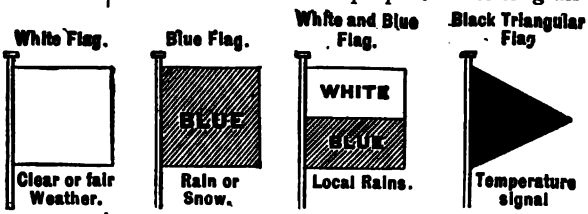
Sigismund (*sĭj'ĭs-mŭnd*), emperor of Germany, was born Feb. 14, 1361. When only nineteen, he became king of Hungary through his wife. He was terribly defeated in an expedition against the Turks at Nicopolis in 1396. Some years later he conquered Bosnia, Herzegovina, and Servia. He became emperor of Germany in 1411. His name is known by his failure to uphold the safe conduct he had granted to Huss, and so allowing him to be burned by his enemies. His succession to the throne of Bohemia after his brother's death was opposed by the Hussites, and he only secured it after making concessions, a year before his death, which took place Dec. 9, 1437.

Sig'naling, any means of sending intelligence to a distance by sight or sound. The earliest signals in war were by means of torches and beacon lights. Ships depend upon a system of flags, varying in arrangement, color, and shape. What is known as *The International Code of Signals*, prepared in 1857, has been adopted by nearly all the nations of the world. It makes use of eighteen flags, with which it has been found that 78,000 different signals can be given, using no more than four flags at a time. The flags are blue, red, yellow, or white, and square or long and pointed, called pennants. When a square flag is uppermost it is a danger signal. Some of the flags are used as letters, and so spell out words. At night, red, green, and white lights are used, instead of the colored flags, and ships in danger fire cannon and send off rockets. In fog, mist, and snow storms, vessels at anchor ring a bell, a steamer moving blows its whistle, sailing vessels use a horn, all at least once in every two minutes. The signals and their meaning are published in the signal book, and copies are made in the different languages of the nations using the system.

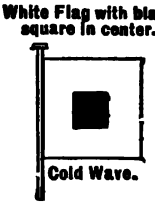
Sig'nal Ser'vice, United States. There are three authorized systems of signaling, those of the army, the navy, and the weather bureau.

In the army, the value of a thorough system was readily seen, and in 1860 an appropriation was made to introduce field-signaling under the charge of an officer with the rank of major. In 1863, the signal corps was placed entirely in the care of a chief, with the rank of colonel. In 1870, a meteorological division was added, and in 1891, this was transferred from the war to the agricultural department. There is a school of instruction in military signaling at Fort Riley, Kansas, where, in a course of six months, is given a thorough knowledge of all the codes, and the practical use of the various sorts of apparatus, consisting of flags, the heliograph, the field-telegraph and telephone trains, used by day; and torches, lanterns, rockets, bombs, and searchlights, used by night. The code used in visual signaling is based upon the Morse system of dots and dashes.

In the navy, the *General Signal Book* and the *Fleet Drill Book* contain the code of day and night signals, so that, in order to send a certain message, it is necessary only to hoist flags representing the number of that message in the proper volume. At night, in place of flags, red and green fireballs are shot into the air to serve the same purpose. For long distance signaling, electric lights are used, and it is even possible to signal a ship below the horizon by casting searchlights upon the clouds.



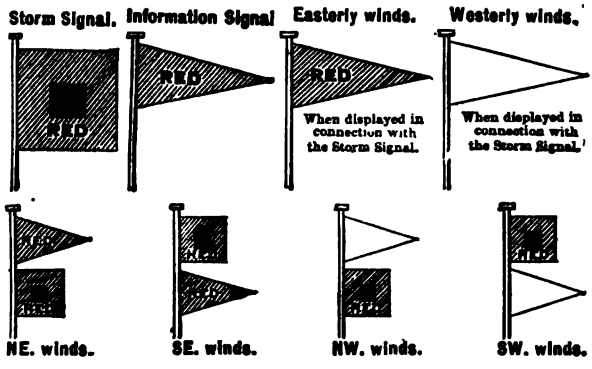
The weather bureau has perfected a system of signals by which it can publish the weather forecasts. Throughout the country are stationed agents who observe the indications of the weather and telegraph forecasts to thousands of towns and cities, which then display the appropriate flag, chosen singly or in combination from among the preceding.



Temperature is forecasted by placing a black flag above the weather flag for higher, and below the weather flag for lower temperature. The approach of a cold wave is announced by displaying the above flag.

Along the seacoasts and on the Great Lakes the following flags signify the approach of dangerous winds: —

When storms of exceptional violence are feared, the news is spread through the aid of rockets, whistles, and other signals. The reports of the weather bureau are given wide publicity, chiefly in the pages of the daily newspapers.



[*At night, red and white lanterns replace flags.*]

Sigourney (*sig'ur-ni*), **Lydia Huntley,** an American writer, was born at Norwich, Conn., Sept. 1, 1791. Her first publication in 1815 was called *Moral Pieces in Prose and Verse.* She compiled books for the young, contributed to magazines, and was one of the earliest women in America to enter the field of authorship. She has been called the "American Hemans." *A Sketch of Connecticut, Pocahontas and Other Poems, Tales in Prose and Verse,* and *Letters to Young Ladies,* are the titles of some of her books. She died at Hartford, June 10, 1865. See *Letters of Life,* an autobiography.

Sigsbee, Charles Dwight, Captain, American naval officer, was born at Albany, N. Y., Jan. 16, 1845, and graduated in 1863 from the United States Naval academy. In the Civil war, he served in the West Gulf squadron and was present at the battle of Mobile bay; he also served in the North Atlantic squadron and was at both attacks on Fort Fisher and at the final assault on the Fort. He also served on the China Station, and at the head of various departments of the Naval academy. He had command successively of the *Kearsarge, Dale, Constellation, Portsmouth,* and of the *Blake,* in the deep-sea explorations undertaken by the United States coast survey. He was in command of the battleship *Maine,* when it was destroyed in Havana harbor, Feb. 15, 1898. During the Spanish-American war he commanded the United States auxiliary cruiser *St. Paul,* in operations against Cuba and Porto Rico, and later was transferred to the *Texas.* Has published *Deep-Sea Sounding and Dredging,* and the *Story of the Battleship Maine and Its Destruction* —a personal narrative.

Sikhs (*sēks*), a religious sect in northern India. The word means "followers," or "disciples." It was founded by Baba Nanak in the 15th century, who rejected the caste system of India and idolatry, and taught the worship of one God. At the end of the 16th century, the holy temple was built at Amritsar, which is the headquarters of the sect. As they increased in numbers, they gradually assumed military power, and in the 18th century, under Ranjit Singh, a young warlike chief, they became a great military force. He kept the treaty he had made with Great Britain, but at his death his large and well-drilled army invaded the British territory in India in 1845. After several battles and defeats, they were at last conquered in 1849, and the Punjab was annexed to the British possessions. At the time of the mutiny in India, the Sikhs remained loyal to England. The Sikhs form about six per cent. of the population of the Punjab, and there are fifteen protected Sikh states connected with the Punjab government. They number about 1,907,836. See *History of the Sikhs,* by Cunningham.

Silesia (*si-lē'shi-a*), a province in southeastern Prussia, covering 15,566 square miles. It is crossed by the Oder river and the Sudetic mountains, between which is a very fertile region, while on the northern and eastern sides of the Oder there are marshy and sandy tracts. One of the most productive coal mining regions of Prussia, covering 530 square miles, is in the southeastern corner of Silesia, and there are also mines of zinc. The crops produced are the usual cereals and flax, beet-root, chicory, and hops. The manufactures are important, including linen, cotton, and woolen goods, beet-root sugar, metal manufactures, glass, and tobacco. The capital is Breslau. The population, including 820,000 Poles, 55,000 Bohemians, and 32,000 Wends, numbers 4,668,378. All schools are under the direction of the minister of public instruction, and elementary education is free and compulsory.

Silesia in the 10th century was under Polish rule; about the end of the 12th century it was divided into Upper and Lower Silesia, and by the beginning of the 14th it was separated into a number of small states, under King John of Bohemia, which in 1526 fell to Austria. Austria and Prussia struggled for the country, the claim of Prussia being based upon a contract by which the duke of Leignitz in 1537 left his lands to the elector of Brandenburg in case he had no other heir. The three Silesian wars, the first, 1740–42; the second, 1744–45; and the last in 1756–63 (the Seven Years' war), ended in securing Silesia to Prussia, except the Austrian duchy of

Silesia, a country south of Prussian Silesia, covering 1,987 square miles, rich in mines, and with a population numbering 605,649.

Silica (*sĭl'i-kă*), a compound of silicon and oxygen (SiO_2), is found in the pure state in the form of quartz or rock-crystal. Flint, sandstone, and chalcedony are nearly pure silica. It occurs also in combination in a large number of abundant minerals which are called silicates, and of which feldspar, mica, hornblende, and clay, are examples. Silica exists in many plants, particularly the grasses, in the quill feathers of birds, and in sponges. Most animals contain very little of it. Silicon, the non-metallic element contained in silica, is never found in the free state, and although it is next to oxygen the most abundant element in the earth's crust, it is merely a chemical curiosity, being very difficult to separate from oxygen. Silica is largely used in making glass, and is an important constituent of porcelain, china, bricks, etc.

Silicle (*sĭl'i-k'l*), a short silique, the peculiar fruit of the mustard family. See FRUIT.

Silique (*sĭl'ik*), the peculiar pod-like fruit of the mustard family, characterized by a false partition which runs lengthwise and divides the pod into two chambers. See FRUIT.

Silk, the name of the cloth and thread manufactured from the fiber obtained mostly from the cocoons of the silkworms. The making of silk probably originated in China, the wife of an emperor being credited with first unwinding a silk cocoon, in 2600 B. C. The silkworm's eggs were brought to Constantinople from China, about 552, by two Persian monks, who carried them in a hollow cane. They were successful in raising them and in introducing the manufacture of silk. The new industry spread through Greece, was carried into Sicily by prisoners of war, and brought to Spain by the Moors. Louis XI. and Francis I. imported workmen from Milan into France and succeeded in starting the silk manufacture, after the cultivation of the mulberry tree for food for the worms had been established, in 1564. In England, silk manufacture began under James I., but received a powerful impulse in 1685, when a large number of silk weavers were driven from France to England by the edict of Nantes. James I. made an effort to introduce the industry into the American colonies, sending eggs to Virginia and offering rewards for their cultivation, but tobacco was more profitable. It was cultivated in South Carolina and Connecticut before the Revolutionary war. There have been several efforts to make the cultivation of the silkworm more general in the United States, one in California in 1854 and a woman's association formed in Philadelphia in 1876, but with no very great result. The manufacture of silk is, however, carried on quite extensively, the center of the industry being Paterson, N. J., where there are more than one hundred silk factories. France is the principal silk-making country, the British silk trade having been very much injured by the introduction of French goods free. The process of manufacture takes the raw silk, obtained from the cocoons of the worm, by winding it off through a reeling machine, cleans, twists, and doubles the threads and winds them on bobbins and reels for the weaver. There is a considerable amount of waste in all the processes, which, known as waste silk, was for a long time considered useless, but in 1857 a method of spinning yarn out of this waste was invented by an Englishman, Mr. Lister, of Bradford, England, which has added very much to the industry. The process of weaving silk from the prepared thread resembles that of weaving cotton or woolen goods. See SILKWORM.

Silk'worm, any larva or caterpillar which produces a silken cocoon used in the manufacture of silk. The name applies especially to the famous silkworm (*Bombyx mori*) that feeds on the mulberry tree. All silkworms are the larvæ of moths. Their eggs are laid to the number of 200 or 300 by a single individual. On hatching, the caterpillars go through several moults. When they reach the fifth stage they eat enormously, and attain a length of three or three and one-half inches. They are now naked, worm-like animals of a pale greenish color. About thirty-six days, or more, after hatching, they begin the formation of the cocoon, in which they undergo the transformations that convert them into moths. The cocoons are the source of the silk. They are usually white or yellowish and about an inch or more long and one-half as broad. The silk comes from a pair of long, tubular glands which open upon the lower lip of the animal. Just as the material of a spider's thread hardens on contact with the air, so this silk substance is formed into a delicate strand. While this is issuing from the orifice in the lower lip, the head of the worm is continually worked back and forth, in such a manner that the thread is wound in spirals around the entire length of its body. There is formed in this manner one continuous thread of surprising length — being nearly four-fifths of a mile long. The thread is matted together by a gummy substance. It is loosened in hot water and the thread, united with those from four or five other cocoons, is unreeled. The process may occupy four days. There are several kinds of silk-pro-

SILK-WORM, LARVA, CHRYSALIS, AND COCOON.

ducing larvæ, but all others are inferior to the mulberry silkworm. The Ailantus silkworm and the polyphemus moth, together with the larvæ of imported mulberry moths, are reared in America. China, Japan, Italy, France, and India are the principal silk-producing countries. The silk industries of the United States amounted, in 1890, to nearly $70,000,000, and are increasing. Paterson, N. J., is the center of the silk manufacture, and is sometimes called the Lyons of America.

Silliman (*sil'i-man*), **Benjamin,** an American scientist, born at Trumbull, Conn., Aug. 8, 1779. He studied at Yale college, and after his appointment there as professor of chemistry, attended chemical lectures for three years at Philadelphia, and for one year at Edinburgh and at London. He filled the chair of chemistry at Yale for about fifty years. He did much to make the study of chemistry and geology popular, by public lectures through the country in 1808. He was the first president of the American Association of Geologists and Naturalists, and founded the *American Journal of Science*, known as *Silliman's Journal*, which he edited for twenty-eight years. His textbook on chemistry was published in 1830, and, in 1853, appeared his *Narrative of a Visit to Europe*. He died at New Haven, Conn., Nov. 24, 1864. See *Life*, by Fisher.

Silo'am, a pool cut in the rocks southeast of Jerusalem, and connected with it by an aqueduct.

Sil'ver, one of the metals, ranking among the commoner metals next to gold in value. It is known by its white color, its luster, and the ease with which it is worked. It is harder than gold, and takes a fine polish. It is never found pure, being always mixed with a little copper or gold, or some other metal, but in what is called its native state is widely distributed. It is almost always found associated with gold, and all gold when mined contains more or less silver. The combinations of silver with other substances, such as sulphur, oxygen, and chlorine, and especially in the ores of lead, form the largest part of the silver ores found. In Europe, the largest silver mines are in Norway and have been worked since 1623. One piece of silver in the Copenhagen museum weighs 560 pounds, and another piece was dug out in Norway weighing over 1,500 pounds. Silver is also found in Saxony, Bohemia, Hungary, and Spain. The mines of silver in the United States are found mostly in Minnesota, Nevada, Arizona, California, Idaho, Utah, Colorado, New Mexico, and Montana. The Comstock lode, a silver mine in Nevada, is probably the most productive silver mine ever worked. The silver region of the western United States was discovered only in 1859, but now produces one-half of the silver of the world, being more than $70,806,626 in 1899. The rich silver mines of Mexico and Peru, worked by the Aztecs, were developed by the Spaniards after the conquests of Cortez in the 16th century. Humboldt reports about 3,000 different mines in operation in Mexico. Australia is now added to the silver producing countries, the yearly product of the silver districts in New South Wales reaching $10,000,000.

Silver is one of the most useful of the metals, being used in coinage, plate, and jewelry, and its compounds in photography, glass staining, etc. It is too soft to be used alone, and is generally mixed or alloyed with copper. Silver coins in the United States contain one-tenth of copper and nine-tenths of silver. See METALLURGY. See also *Gold and Silver*, by Phillips.

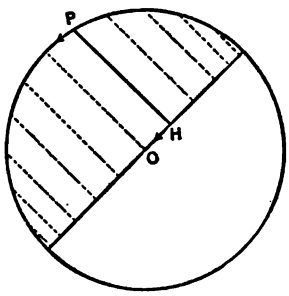
Simms, William Gilmore, American historian, novelist, and poet, was born at Charleston, S. C., April 17, 1806, and died there June 11, 1870. In early life he studied law, but abandoned it for journalism and later for literature. He specially devoted himself to the writing of a series of some 17 volumes of fiction, including romances of colonial life, romantic tales of revolutionary incidents in South Carolina, of which he wrote a history, a geography of the state, and an account of South Carolina in revolutionary times. He was for several years a member of the legislature of his native state, and filled other political offices. He had, besides a fertile mind, a vivid imagination and the power of writing an interesting and realistic novel; he also wrote verse, of which a compilation exists. Of his novels perhaps the most notable are *The Yemassee*, *Guy Rivers*, *Pelayo*, *Carl Werner*, *The Scout*, *The Partisan*, *Count Julian*, *Mellichampe*, and *Border Beagles*. His best, as it is his longest, poem is entitled *Atalantis: a Drama of the Sea*. See his *Life*, by George W. Cable, in the "American Men of Letters" series.

Simon (*se-môn'*), **Jules,** a French statesman and writer, was born at Lorient in 1814. His real name was Suisse, which he changed to Simon. He succeeded Cousin as lecturer at the Sorbonne in 1839. In 1848, he was elected to the chamber of deputies, refused the oath of allegiance to the empire, and by 1869 was one of the most popular leaders of the Republican party. He was minister of public instruction, but was opposed by the church influence, and resigned in 1873. He was elected a life senator in 1875, and in 1876 became prime minister, but resigned because of objections to his views on the freedom of the press. He took, however, a leading part in the revision of the constitution, and was a member of the educational council. Besides editing *Descartes*, *Bossuet*, and *Malebranche*, and contributing to periodicals, he wrote *Liberty of Conscience* and *Liberty*, *Natural Religion*, *The Workman*, *The School*, and *The Government of Thiers*. He died at Paris, June 8, 1896.

Si'mon Ma'gus (Simon the Magician) a sorcerer of Samaria, mentioned in the book of Acts. He was apparently a prominent person in the city of Samaria, about 37 A. D., and was called, because of his skill, "the great power of God." Becoming a convert to Christianity under the preaching of the evangelist Philip, and seeing the apostles Peter and John confer the gift of the Holy Ghost, including probably the gift of tongues, he attempted to buy miraculous power of them. His rebuke by Peter ends the Scripture account of him. Justin Martyr says that he went to Rome, where a statue was erected to him with the inscription "To Simon, the Holy God," and according to Irenæus, he was worshiped as Zeus or Jupiter. Hippolytus records that he met Peter at Rome and that he ordered his followers to bury him, promising to rise on the third day. But these stories rest on very uncertain foundation, and leave only as certain the existence of a great magician called Simon.

Simoom (*si-mōm'*) or **Simoon,** a hot, suffocating wind, common in the deserts of Africa and Arabia. It is very much like a cyclone, with a calm center surrounded by whirling blasts of very hot air, the whole moving slowly from south to north, or from east to west. It often carries along columns of sand, and is indicated by a purple atmosphere. It is very injurious to both men and animals, causing severe pain and a feeling of suffocation. It lasts only for a few minutes, not more than twenty at the most, and occurs in spring and summer.

Sim'ple Harmon'ic Mo'tion is the projection of uniform circular motion upon a diameter of the circle. Referring to the accompanying figure, let P be a point moving with uniform speed in the circumference of the circle. And from the point P, in each of its successive positions, imagine a perpendicular let fall upon the diameter there shown. The motion of the foot of this perpendicular H to and fro along the diameter is a simple harmonic motion, and is often indicated by the letters S. H. M.



SIMPLE HARMONIC MOTION.

The circle in which we have imagined the point P to move is called the *circle of reference.*

The radius of this circle is known as the *amplitude* of the S. H. M.

The time occupied by one round trip of the point H to and fro across the diameter is called the *period* of the S. H. M.

The angle between the radius OP and the radius from which angles are measured in this circle is called the *phase* of the S. H. M.

The value of the phase at the instant from which time is measured is called the *epoch* of the S. H. M.

The distance of the point H from the center of the circle at any instant is called the *displacement* of the S. H. M.

Any S. H. M. is completely described only when we know four things about it, namely:

1 — The *amplitude.*
2 — The *period.*
3 — The *phase* at any time, t.
4 — The *direction* of motion of the point P in the circle of reference.

If we denote the amplitude by A, the period by T, the phase by θ and the displacement at any instant, t. by x, then the equation of S. H. M. is

$$x = A\cos\ \frac{2\pi}{T}\,t$$

$$\text{where } \frac{2\pi}{T}\,t = \theta$$

No one motion in nature is more frequently met with than S. H. M. The motion of a freely suspended pendulum bob is practically simple harmonic. A ball suspended by a vertical spiral spring oscillates up and down in a vertical line with a S. H. M. Air particles set in motion by a tuning fork vibrate to and fro with a S. H. M. Ether particles when traversed by a ray of light probably vibrate with a S. H. M. See Worthington's *Dynamics of Rotation*, or Daniell's *Physics*, for more complete discussion.

Simp'son, Sir **James Young,** a Scotch physician, was born in Linlithgowshire, Scotland, June 7, 1811. He studied in Edinburgh, attracting attention by his ability, and especially by his thesis on *Death from Inflammation*, when he took his medical degree. He rose rapidly in his profession, contributing largely to the renown of the Edinburgh school. In 1847, he was made one of her Majesty's physicians for Scotland. His greatest claim to distinction rests on his introduction of chloroform into medical use in March, 1847. His publications include a large number of medical works. He died May 6, 1870. A bronze statue of him was erected in Edinburgh in 1877. See *Memoir*, by Duns.

Sinai (*sī'nī*), a mountain in the northwestern part of Arabia, known as the place where Moses received the tables of stone, inscribed with the ten commandments. The mountain is a single peak in a great rocky mass which almost fills the peninsula of Sinai, a point of land shut in between the two arms of the Red sea, the gulf of Suez, and gulf of Akaba. There are three separate mountains; Mount Katherine being the one usually thought to be indicated by the name Sinai. This mountain has two peaks, the northern one, known as Mount Horeb, and the southern one, called the Mountain of Moses. This southern peak is generally agreed upon as the place of the giving of the law, though it is still disputed.

At its foot, is the Church of St. Catherine, built about 527 by the Emperor Justinian; a little higher up, the chapel of St. Elias, and on the summit a little pilgrim church. The whole peninsula, as well as the bold, jagged mountains, have a stern, treeless aspect, though palms, acacias, and tamarisks grow in the ravines. The Arabs range over the region with their sheep and goats. There are many caves among the mountains which have been the abodes of hermits, and many inscriptions on the rocks which date back to the era of the early Christians. See *Sinai and Palestine*, by Stanley; *Desert of the Exodus*, by E. H. Palmer.

Singapore (*sing-ga-pōr'*), ("Lion City"), a town of India on the island of Singapore. It was founded in 1819 for the British trade in the East Indies, and is now the most important trading place in southeastern Asia. It is a well-built town, with fine public buildings and all kinds of conveniences in the way of public works. There is a governor's residence, a Protestant cathedral, and a Catholic cathedral, Mohammedan mosques, Hindu temples, Chinese joss-houses, a museum, and hospitals, also fine botanical and zoological gardens. The harbor is large, and is used as a naval coaling station and depot. The population, numbering 185,000, includes 135,000 Chinese, 25,000 Malays, and about 4,300 Europeans. The climate is pleasant, though the death rate is high.

Sioux (*sō*), a group of tribes of American Indians belonging to the Dakota family. They are the principal tribe of the family, and sometimes their name is given to the whole family. They were living near the head waters of the Mississippi when found by the whites. In their wars with the Chippewas and the Hurons, some of them were driven farther south, but in 1822 they numbered about 12,000, and their lands stretched from the Mississippi river to the Black Hills. In 1837, and again in 1851, they ceded parts of their land to the United States. The failure of the government to carry out their treaties irritated the tribes, and they troubled the white settlers for some years and in 1862 made a general uprising, killing nearly 1,000 whites. New Ulm, in Minnesota, a town of 1,500 people, was nearly destroyed. This rebellion ended in the imprisonment of more than 1,000 Indians and the execution of 39 of the leaders, and cost the United States $40,000,000. The Santee Sioux were placed on reservations near Yankton, S. D., where they have become peaceful farmers. After a vain endeavor to settle matters peacefully, Sitting Bull, a young chief, and others going to Washington for the purpose, the hostile tribes gathered in North Dakota and began the war of 1876, in which General Custer perished. Large settlements of the Sioux have been made since in South Dakota. In 1890, under a "messiah," there was another rising of the Sioux in the northwest. They now number about 25,000. See *Forty Years among the Sioux*, by Riggs.

Sioux (*sō*) **City**, a city of Iowa, on the Missouri river, which is crossed by a bridge 2,000 feet long. It is a railroad center and a manufacturing city, and has a large trade, being situated in a fine farming region. There are large meat packing establishments and flaxseed oil mills, and vast quantities of stoneware; here 25,000,000 bricks a year are made. Among the notable buildings are the city hall and public library, the Federal building, and the Young Men's Christian Association building. The city has a good system of public schools, and here is located Morningside college, a Methodist Episcopal institution. Population 33,111.

Sioux Falls, a city in South Dakota, the largest town in the state, is on the Big Sioux river, and takes its name from the falls of the river, which here descend ninety feet. The city was laid out in 1847, and destroyed by the Sioux in 1862. It was rebuilt after Fort Dakota was abandoned in 1870. The buildings are nearly all of red granite. The great industry is the quarrying and polishing of the granite underlying the city. There are also manufactories, a state penitentiary, a public library, the Sioux Falls university, with a large building of jasper, and a Catholic seminary. Population 10,266.

Siphon (*sī'fŏn*), an instrument for transferring liquid from a vessel at one level to another vessel at a lower level. The simplest possible form is shown in the accompanying figure, where the liquid A is being emptied into the vessel D.

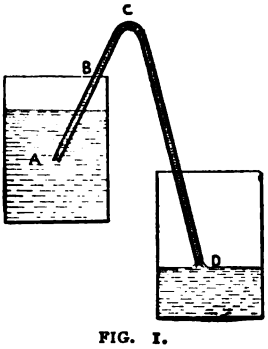


FIG. 1.

In order to start a siphon the pressure of the air must be diminished in the branch C D. The pressure of the atmosphere on the surface B then forces the liquid up the arm A C, and, in flowing down the arm C D, this liquid acts as a pump, and keeps the pressure in C D below that of the atmosphere.

Evidently, however, this pumping must cease as soon as the liquid in the vessel D rises to the same level as the surface B.

It is also clear that, since the water is driven up into the arm A C by means of the earth's atmosphere, no siphon will work in a vacuum.

The most safe and convenient form of siphon, especially for transferring acids, is that shown in figure 2, which is provided

with a mouthpiece for starting, but without danger of getting acid or poison into the mouth. The action will be evident from the figure.

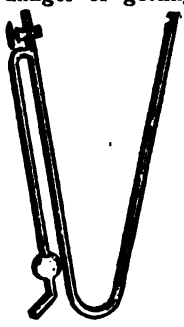


FIG. 2.

Siphonogamy (*sī-fŏ-nŏg'a-mĭ*), a condition in plants in which pollen tubes are developed for the transfer of the male cells to the eggs. The seed plants are siphonogamous; while in the lower plants the male cells usually swim to the eggs. As a consequence, the Spermatophytes are called Siphonogams by some botanists.

Si'rens, sea nymphs in Greek mythology, who sat on the shores of an island off the southwest coast of Italy, and by their songs lured the passing sailors to their death. The *Odyssey* tells the story of Ulysses stopping the ears of his companions with wax, and lashing himself to a mast, till they had sailed out of hearing of the fatal songs. The Argonauts also were carried past in safety, because the music of Orpheus had a stronger spell, seeing which the sirens threw themselves into the sea and were turned into rocks. By the Latin poets they are represented with wings, and in art as birds, with the faces of young women. See *Myths of the Odyssey in Art and Literature*, by Harrison.

Sir'ius. See Dog Star.

Siroc'co, a hot wind which blows on the southern coasts of Italy, lasting sometimes a week. It is hottest in Malta and Sicily, but does not last as long as on the Ionian islands. It is like the simoon, and produces the same feeling of suffocation and exhaustion.

Sisyphus (*sĭs'ĭ-fŭs*), in Greek mythology, the son of Æolus, the founder and king of Corinth, and noted for his wickedness, for which, according to Homer, he was condemned to roll a large stone up a hill, which, when it reached the top, fell back again, so that his task was never ended.

Sit'ka, the capital of Alaska, is on the west coast of Baranoff island. It has a deep harbor, dotted with islands, with snowy peaks rising behind the town. There is a fine green-spired Greek church and an old Russian palace. The climate is cold, with a large rainfall. Population 1,188.

Sit'ting Bull, an Indian warrior of the Sioux tribe, born in 1837. When gold was found in the Black Hills, an effort was made by the United States to purchase the land of the Sioux, to whom it belonged. They were very unwilling to give it up, and Sitting Bull, Red Cloud, and Spotted Tail, with other chiefs, visited Washington in May, 1875, but would not sign the treaty. The failure of the government to keep its promises, and the actions of the settlers, in pushing on to the lands, kept up a feeling of hostility, and the young braves of the tribes gathered around Sitting Bull in Northern Dakota. General Custer, with a small force, was sent against them, and he and his followers were all killed; but the Sioux were at last conquered and Sitting Bull escaped to Canada, but on promise of a pardon surrendered. In the rising of the Indians of the northwest, in 1890, Sitting Bull was killed.

Six'tus, the name of five popes.

Six'tus IV., Pope, was born July 22, 1414, in a small village near Savona, Italy. He had a great reputation as a preacher throughout Italy. He became pope in 1471. He exhausted the treasures of the papal church in providing for his relatives, and took part in a conspiracy against the Medici at Florence. Learning, and especially the improvement of the city, owed much to him. He built the Sistine chapel and the Sistine bridge across the Tiber, increased the Vatican library, and patronized the great painters of his time. His union with the Venetians against the duke of Ferrara brought on an Italian war, which ended in the breaking up of the Venetian alliance. The pope is said to have died from mortification at this result Aug. 13, 1484. See *Lives of the Popes*, by Ranke.

Six'tus V., one of the most able of the popes, was born Dec. 13, 1521, near Montalto, Italy. He was a professor of theology at Rimini and Siena, an eloquent preacher, vicar-general, and cardinal. While Gregory VIII. was pope, he lived in retirement, and was thought to have become old and infirm, which recommended him to the cardinals, who were to select a successor to Gregory. But those who thought to lead him were soon undeceived by his vigorous administration. He stopped disorder, improved the working of the laws, gave liberty to the Jews to worship in their own way, and to trade in his dominions. He built the library buildings of the Vatican, authorized a new edition of the Septuagint and the Vulgate, and in every way carried out his policy of increasing the power of the Catholic church against the Huguenots, the Lutherans, and Queen Elizabeth. He died Aug. 27, 1590. See *Lives of the Popes*, by Ranke.

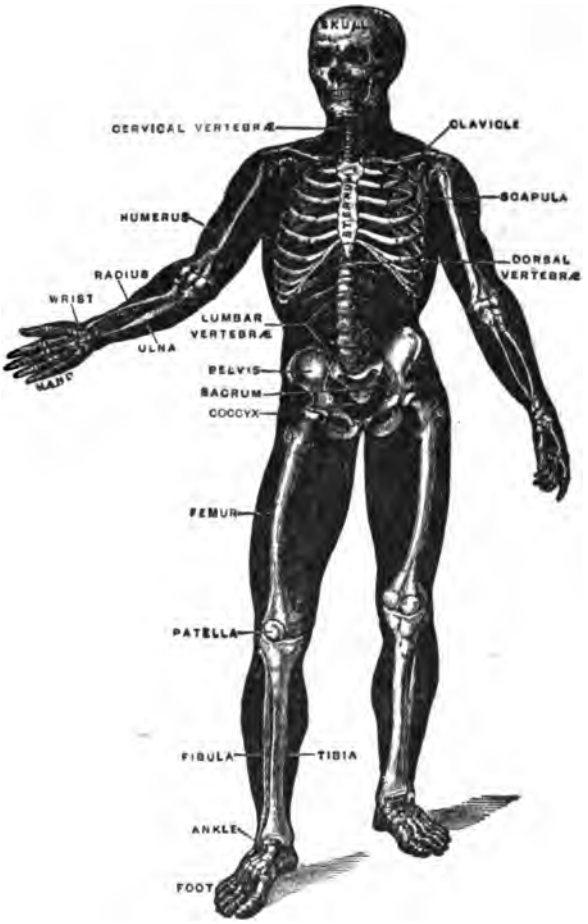
Skag'er-Rack (*răk*), an arm of the North sea, between Denmark and Norway. It is 140 miles long and 70 miles broad. It is subject to violent storms, but when quiet the current runs east on the coast of Denmark, and west on that of Norway. The harbors are all on the coast of Norway.

Skate, a common name of several kinds of the ray. The tobacco box skate, barndoor skate, and briar skate are American varieties, and the tinker and the gray skate are found

in Scotland and in England. Their egg cases, called "mermaid's purses," are often thrown upon the beach. The flesh is coarse and the expanded fins are the parts usually eaten.

Ska'ting is moving on the ice by means of steel blades fastened to the soles of the shoes, called skates. In early times, the shin bones of animals were tied to the feet, and by using a stick to push with, the wearer could move over the smooth surface of the ice. Skates now used are of two kinds, those for speed and those for figure skating. The blades for speed skating are very thin and longer than the foot, while those for making figures are broader and rounded at the toe and heel. In the northern countries of Europe, where the ice has a slight covering of snow, skating is very popular. The motion is rapid, the Frieslanders traveling often 15 miles an hour. Skate racing is often practiced, the fastest time yet made being a mile in 2 minutes and 52 seconds. Figure skating is practiced in America, Canada, Holland, Germany, Norway, Sweden, and Denmark. Ice rinks are used for this amusement, and are often crowded with spectators. Wheel skates or roller skates were invented in 1865, by Mr. Plimpton, of New York; the use of them is a fine preparation for skating, and the amusement has been very popular.

Skel'eton, the hard parts of an animal. Accepted in this broad sense, the skeleton includes the hard outer covering, or exo-skeleton, and the inner bones, or endo-skeleton. As examples of exo-skeletons we have the shells of clams, snails, and other mollusks; the shell or test of the sea-urchins; the limy plates of the star-fishes; the shell of the lobsters and cray-fishes; the bony carapace and plastron of turtles, and the like. The internal bony framework of vertebrated animals is an endo-skeleton consisting of bones and cartilages. The comparative study of endo-skeletons leads to many interesting conclusions. There are similar or homologous parts in them all. For example, the wing of a bat or bird is constructed on the same plan as the flipper of a seal, the fore-limb of a dog, a horse, or a man. That is, corresponding bones can be made out in them all. The same is true of hind-limbs and other parts of the skeleton, including the skull. This serves to unite animals on the line of similitude of structure. The hard parts are for protection, when on the outside, and also for the attachment of muscles. Not only is there correspondence between the bones of different animals, but the muscles, nerves, and blood vessels are also similar. The fossil bones of extinct animals have furnished clues to the past history of life on the globe. There are upwards of two hundred separate bones in the human skeleton. The actual number of distinct bones varies at different periods of life; many bones which



HUMAN SKELETON.

are separated in youth become united in old age. The skull has twenty-two distinct bones in early adult life; but in youth the number is larger, and in old age less. There is a tendency for the bones to unite in old age. There are originally thirty-three separate bones in the spinal column. Twenty-four of these remain distinct throughout life, while the lower nine become consolidated into two groups, the sacrum and the coccyx. Twenty-four ribs bound the chest, and most of them are connected by cartilage with the breast bone or sternum. The shoulder-blades, the collar-bones, and two hip-bones are connected with the arms and limbs respectively.

There are thirty bones in each arm, and the same number in each leg, counting the kneepan. The bones are held together by ligaments. See the illustration for further names. See also FOOT, HAND, and SKULL.

Skim'mer, a class of web-footed, long-winged sea birds, belonging to the gull family. They have a long, thin bill with the upper half shorter than the lower. There are only three known species, each kind being confined to one country. The American skimmers, called shearwaters, skim along the surface of the water in flocks, using the lower part of the bill as a plow to bring up the small fish on which they feed, and holding them with the upper half of the scissors which their bills form. They are also called scissors-bill or razor-bill shearwaters. The other varieties are found in Asia and Africa. See GULL.

Skin, the investing membrane of the body of an animal. In vertebrated animals it consists of two layers, an outer epidermis and an inner dermis or true skin. The former is largely for protection, the latter plays an important part in physiology. The epidermis has neither blood vessels nor nerves, but the true skin is richly provided with both. The dermis is made of a dense feltwork of fibers, and, in the human body, is from one-fiftieth to one-tenth of an inch in thickness in different parts of the body. Its outer surface is raised into little hillocks, called papillæ. These are of two kinds, the vascular papillæ containing a network of minute blood vessels, and the nervous papillæ in which the nerves terminate. There is often an oval touch corpuscle in which the nerve has its ending. The epidermis lies on the dermis and dips into all of its depressions. It is composed of cells, the outer layers of which are reduced to flattened scale-like elements, which are continually falling off or being removed by bathing and friction. They are as continually renewed from a deeper layer of plump cells which divide rapidly. Thus the outer skin has two layers, a horny layer and a mucous layer. The latter is the seat of the pigment or coloring granules which impart color to the skin. In negroes, it includes a rather dense layer of dark granules. All over the body the skin has minute orifices which are the openings of small tubes connected with the sweat glands. These consist of coiled tubes located in the deepest part of the true skin, or just below it. A tubular duct extends from each gland to open on the surface, and as it passes through the layer of the skin it runs in spirals, like a corkscrew. The number of sweat glands varies greatly in different parts of the body, they are fewest in the back and neck, being about 400 to the square inch. On the skin of the palm and sole there are two or three thousand to the square inch. Hairs, nails, hoofs, scales, and like structures are outgrowths from the epidermis of the skin. Consult topics, HAIR and FEATHERS. The skin performs important offices. The watery vapor passed off by it in the form of perspiration amounts to about 2½ lbs. a day. It also liberates carbon dioxide. In some animals, like frogs, it is an important aid in respiration. It is also concerned in regulating the temperature of the body. When the body is covered with a varnish or layer of leaf metal, death results, not from stopping the perspiration as was formally supposed, but by radiation of heat and fall of bodily temperature,— the skin being unable under the conditions to regulate the temperature. The touch corpuscles in the skin give it an important sensory action in connection with the nervous system.

Skull, the hard framework of the cranium including the lower jaw. The skull in fishes, and in mammals, although so different in general appearance, is composed of corresponding bones. They are more separated in the fish, and more modified and united in the higher animals. In sharks and other cartilaginous fishes the skull may be entirely cartilaginous throughout life. The question of the nature of the skull perplexed naturalists for a long time. Early in the 19th century the German philosopher, Oken, and the poet-philosopher, Goethe, declared the skull to be composed of modified vertebræ. This idea was extensively developed by Richard Owen, in his great work on «Comparative Anatomy of the Vertebrates.» Thus arose what was called the vertebral theory of the skull. Huxley showed, however, in 1859, that the bony cranium is preceded by a skull of united cartilage, having neither sutures nor joints. The bones are formed later, being mostly laid down in the membranes surrounding the original cartilaginous skull, which disappears. Therefore, the bones are not primary structures, and the history of the skull shows that they cannot represent modified veterbræ. By comparing the skulls of different animals corresponding bones can be identified, but the study is technical. See Huxley's *Anatomy of Vertebrated Animals* (1878); Parker and Bettany's *Morphology of the Skull* (1877).

Skunk, a carnivorous animal widely known on account of the offensive odor of a fluid which it ejects when frightened or disturbed. There are several varieties found only in the New World in both North and South America. The common skunk is about the size of a small cat, and ranges from Hudson bay to Guatemala. The body is rather stout, the tail is very bushy, and the prevailing colors black and white. It is usually black, with broad stripes of white running lengthwise. These animals burrow and are active at night. They feed on mice, salamanders, frogs, and eggs of birds that nest very low. Sometimes they rob hens' nests, but this is by no means the rule. They are of positive benefit to the farmer, on account of the large number of

beetles, grasshoppers, and field mice which they destroy. Ordinarily they do not run at the approach of man, but, conscious of the protection of their nauseous secretion, move away deliberately. They can eject this fluid at will a distance of from eight to twelve feet. Their flesh is said to be white and sweet. The fur is considerably used, and in the market goes under the name of Alaska sable.

Skye (*ski*), the largest island of the Hebrides, off the west coast of Scotland. It is forty-nine miles long, and from seven to twenty-five miles broad. It is mountainous, with a few tracts of pasture land, and one large plain. The highest peak of the mountains, called the Coolin hills, is 3,234 feet high. The lake Coruisk, the "dread lake" of Scott's *Lord of the Isles*, and Glen Sligachan, thought to be the grandest glen in Scotland, with columns and cliffs over 1,000 feet high, with waterfalls leaping over them, and deep caves at their foot, are among the interesting scenery of the island. Fish abound, and with potatoes form the main diet of the people, and also furnish the principal industry of the island. The inhabitants (which are chiefly crofters) are principally Celtic, speak the Gaelic language, and number 15,800. The principal proprietors are Lord Macdonald, and MacLeod of MacLeod. See *A Summer in Skye*, by Smith.

Sky'lark, an European bird that mounts high in the sky and sings on the wing. It is the lark of the poets. The larks of America belong to a different family. See LARK.

Slate. See SHALE.

Sla'very, the condition of a man who belongs to a master, who has the right to employ him and treat him as he pleases. It probably arose first from captives made by war. It was general among ancient nations, including the Jews. In Greece, slaves were employed not only for domestic service, but as bakers, tailors, seamen, miners, soldiers, and police. They were usually mildly treated and were often freed. A slave was not allowed to wear his hair long, nor to enter the gymnasia and public assemblies, but could appear in the temples and at festivals. At one time there were 200,000 slaves in Attica, being three times the number of the freemen. Roman slavery was very severe, as is seen by their gladiatorial combats. Old and useless ones were often left to starve on an island in the Tiber. The cruelty of the masters was gradually softened by the law — a very cruel one being obliged to sell his slaves. The slave could not own property, though sometimes allowed a small portion of his gains when in trade, and could not testify in the courts. In Great Britain, the Anglo-Saxons made slaves of the Celts and other natives, and had a regular trade with the continent in Irish slaves; but with the Norman Conquest slavery was merged into serfdom. The traffic in slaves continued among Mohammedan nations, Christian captives being sold as slaves in the markets of Asia and Africa. The Barbary Corsairs, down to 1812, carried off large numbers from the coasts of Europe into slavery. Cervantes, for five years a slave, reports 25,000 Christian slaves in Algiers alone. During the middle ages in Europe, the class called serfs were, practically, slaves. They were usually attached to the soil and could be transferred with the land they tilled. They could not hold property, but their oath was taken in evidence, and if injured they were protected by law.

Serfdom died out in England and in Scotland gradually, a curious form of it remaining in Scotland to the end of the 18th century. Colliers and saltworkers were bound by law, on entering a coal work or salt mine, to life service there, their labor was transferred with the ground, and their sons could not follow any other trade, nor seek employment in other mines. In France, the Revolution swept away the last remains of serfdom, and in Italy it ended in the 15th century. It was abolished in 1781 in Bohemia and Moravia, and entirely destroyed in Prussia by the reforms of the 19th century, though the mass of the peasants had been free since the end of the 13th century, while Russia put an end to the system in 1861.

Negro slavery of modern times was the result of the discovery of America, the Portuguese introducing them first into the New World to work their mines and plantations. They were first used to any extent in Haiti, in St. Domingo. Sir John Hawkins was the first English slave-trader, followed by others, until England had carried to America, between 1680 and 1700, 300,000 slaves, and between 1700 and 1786, 610,000 into Jamaica alone. The slave trade was very inhuman, the negroes being so crowded on the ships that a large proportion died on the passage. The first efforts to restrain slavery were made to stop the slave trade. In 1787, a society for this purpose was formed in London, with such supporters as Clarkson, Wilberforce, Macaulay, and Sharp. After several years of struggle, the abolition bill, making all slave-trading by British subjects illegal after Jan. 1, 1808, became a law March 7, 1807. The movement was continued until, on Aug. 28, 1833, an emancipation bill was passed giving freedom to all slaves in the British colonies. Slavery was abolished in the French colonies in 1848, in the Dutch in 1863, and in Brazil in 1888. When the American colonies became the United States, in 1776, there were 300,000 slaves in the country, and in 1790, at the taking of the first census, they numbered 697,897, and were found in all the states except Massachusetts, to which Maine then belonged.

The northern states gradually abolished slavery, Pennsylvania having 64 as late as 1840. In the south, many, with such leaders as Washington and Jefferson, opposed slavery

until the invention of the cotton gin made it profitable and developed it, until even the renewing of the slave trade with Africa, abolished by the United States in 1808, was advocated. The contest between the upholders and the opposers of the system, beginning in the north with the formation of societies for the gradual abolition of slavery, and carried on by literature, by lectures, and finally by the political parties, was met in the south by demands for enlarged territory and national laws protecting their slave property in the free states. The Pennsylvania Abolition society was founded in 1775, with Benjamin Franklin as president, and the New York society, with John Jay and Alexander Hamilton as leaders. In 1831, Garrison established the antislavery journal, *The Liberator*. The formation of a northern republic, free from slavery, was the hope of the extreme abolitionists, as the formation of a southern republic founded on slavery was the aim of the extreme pro-slavery party. The contest ended in the Civil war of 1861–65, in the course of which the proclamation of emancipation was issued by Lincoln, Jan. 1, 1863, setting free nearly 4,000,000 slaves, and confirmed in 1865 by an amendment to the constitution approved by twenty-seven of the thirty-six states.

Slavery still exists, and the slave trade is carried on by Arab slave-traders in the interior of Africa, the tracks of their caravans being whitened by the bones of those who have died on the journey. The Congo Free State, the foundation of missions, and the encouragement of trade by the British and German companies, with the help of all Christian governments, it is hoped, will finally put an end to the terrible traffic, in which over 90,000,000 Africans have been enslaved. See *History of the Slave Trade*, by Clarkson; *Rise and Fall of the Slave Power in America*, by Wilson.

Slavs (*slävz*) or **Slavonians** (*sla-vō'ni-ans*), the name of a group of nations belonging to the Aryan family, living in the eastern parts of Europe and northern Asia. The earliest history represents them as living around the Carpathian mountains, and spreading to the Baltic, the Elbe, and over the whole peninsula between the Adriatic and the Black sea. Since the 7th century they have become settled and gradually formed into independent states. There are two divisions, the southeastern and the western. The Russians, Bulgarians, and Illyrians belong to the first division; the Poles, Silesians, and Pomeranians, called Lechs, the Czechs or Bohemians, and the Slavonic tribes of north Germany make up the western division. The only people that have preserved their language are the Wends or Serbs of Saxony and Prussia. The whole Slavonic population is about 100,000,000. They are represented by ancient writers as an industrious race, living by agriculture and having flocks and herds. The government, at first patriarchal, was gradually usurped by the chiefs and the people were reduced to serfs. There was no middle class between the nobility and the peasants. See LANGUAGES, and LITERATURE.

Slidell (*sli-dĕl'*), **John,** an American lawyer and politician, was born in New York city about the year 1793, and died at London, England, July 29, 1871. After graduating at Columbia college, he studied law, and removing to New Orleans practiced there and became a leader in Louisiana politics. From 1842 to 1845 he served in congress as a state-rights Democrat: in the latter year he was sent as minister to Mexico by President Polk, to adjust difficulties arising out of the annexation of Texas, but the Mexican government refused to receive him. From 1853 to 1861 he was a member of the United States senate, and in the Civil war, when Louisiana seceded, he withdrew, and was appointed Confederate minister to France. In company with James M. Mason, who was named minister to England, both were taken on the high seas by Captain Wilkes, of the United States navy, and brought as prisoners to the United States, where they were confined in Fort Warren. On the demand of England, they were released, however, and proceeded on their respective missions. In France, aided by the sympathy of Napoleon III. for the Confederate government, Mr. Slidell, though unable to secure recognition for his government, procured a ship, the *Stonewall*, for the Confederacy, and negotiated with French capitalists for a loan of $15,000,000. After the war closed, Mr. Slidell settled in England and resided there until his death.

JOHN SLIDELL.

Slime Moulds. See MYXOMYCETES.

Sloane, William Milligan, American educator and author, was born at Richmond, O., Nov. 12, 1850, and graduated at Columbia college in 1868, continuing his studies thereafter at Leipsic and at Berlin. At Berlin, he acted at the same time as secretary to George Bancroft, then United States minister to Germany, aiding him in his historical work. From 1876 to 1883 he was assistant and professor of Latin at Princeton university, and from 1883 to 1896 occupied there the chair of history, with intervening visits to Europe. Since 1896, he has been Seth Low professor of history at Columbia university, New York city. He has also been editor of the *New Princeton Review*, and one of the conductors of the *American Historical Review*. Among his writings are the *Life and Work of J.*

Renwick W. Sloane (his father), *The French War and the Revolution*, a *Life of the Rev. James McCosh*, and *Napoleon Bonaparte, a History* (in four volumes).

Slo'cum, Henry W., American general, was born September 24, 1827, at Delphi, Onondaga county, N. Y. He graduated from West Point in 1852 and was assigned to the 1st artillery, with the rank of second lieutenant. After promotion to first lieutenant, in 1855, he resigned in 1856, practiced law at Syracuse, and was elected to the state legislature in 1860. On the outbreak of the Civil war, he was commissioned as colonel of the 27th New York volunteers and took part in the first battle of Bull Run, where he was wounded. In August, he was made brigadier-general, commanded a brigade and later a division in the army of the Potomac, taking part in McClellan's peninsular campaign in 1862. He distinguished himself at the battles of Gaines' Mill, Glendale, and Malvern Hill and was promoted to major-general of volunteers. He fought at second Bull Run, South Mountain, and Antietam, and as commander of the 12th corps rendered signal service at Fredericksburg, Chancellorsville, and Gettysburg. Later he was transferred with his corps to the army of the Cumberland, succeeded to the command of the 20th corps, and was the first to enter Atlanta. In Sherman's march to the sea and through the Carolinas he commanded the left wing, taking part in the actions of that campaign. After the war, he took up the practice of law at Brooklyn, was elected to congress in 1870, and again in 1884. He died at Brooklyn, N. Y., April 14, 1894.

Sloe, a wild plum, called also blackthorn. It is a shrub growing from four to 10 feet high, though sometimes forming a small tree. The branches end in sharp points or spines. The flowers are white, appearing before the leaves. The fruit, about the size of large peas, is sometimes made into preserves, but is bitter and little used. The leaves resemble tea leaves and have been used to adulterate tea, and the juice is used in making an inferior port wine. The wood takes a fine polish and is used for tool handles and canes. The sloe is thought to be the original of all the European varieties of the plum.

SLOE.

Sloth, any one of a group of sluggish mammals living on trees in the forests of Central and South America. Their limbs end in hook-like claws, and they are the most strictly tree-inhabiting of all animals. They usually cling to branches with their backs downward. They crawl with difficulty on the ground and rarely descend to it. They are covered with long, coarse hair, the shafts of which are roughened or fluted. This hair is naturally grayish, but in the damp forests it is covered with a growth of algæ, imparting to it a peculiar green color, which makes the animal difficult to distinguish among the foliage. The algæ disappear in a dry climate and the hair resumes its natural color. They feed upon leaves, young shoots, and fruit. They are silent, inoffensive animals and move mostly at night. About ten species are known. Fossil sloths of colossal size have been found in the rocks.

Slug, a land snail of elongated form, with a small rudimentary shell, covering the lungs and heart, or entirely absent. These animals have feelers with eyes at the extremities, as in the common snail, but the body is not coiled. The shell when present is a small flattened plate usually concealed in the mantle. Some of the common forms reach in length from two to four inches. They often live in cellars. They live concealed under boards and other objects during the day, but are active at night, feeding mainly on vegetables. In Europe they have caused great injury to garden crops.

Smea'ton, John, a civil engineer, was born near Leeds, England, June 8, 1724. He began business as a maker of mathematical instruments, but continued his studies and experiments, inventing, in 1751, a machine for measuring a ship's path at sea. In 1755, he was appointed to rebuild the Eddystone lighthouse. It was built of stone and was the greatest work of the kind at the time, standing for one hundred and twenty years as a monument of his skill. His other works were Ramsgate harbor, the Forth and Clyde canal, Spurn lighthouse, the preservation of the old London bridge, and the Perth and Banff bridges in Scotland. His scientific reports were published by the Society of Civil Engineers, who regarded them as a "mine of wealth." He died Oct. 28, 1792. See *Lives of the Engineers*, by Smiles.

Smelt, a small fish closely related to the salmon, but usually placed in a distinct family. On the western Atlantic coast two species, one more northern than the other, extend from the Arctic to Virginia. They are each about twelve inches long and silvery in color. When fresh, they have an odor resembling cucumbers, and are highly prized as food. Other similar forms occur in Europe and along the Pacific coast of the United States.

Smiles, Samuel, a Scottish writer, was born at Haddington, Scotland, in 1812. He

studied medicine at Edinburgh and practiced at Haddington and at Leeds, finally becoming editor of the Leeds *Times*. Here he met George Stephenson, which led to his writing his life in 1857. His book, *Self Help*, followed, and was at once a success, which has continued, the sales reaching 150,000 copies and the translations being made in seventeen languages. Some of his other works are *Character*, *Thrift*, *Duty*, *Lives of the Engineers*, *Men of Invention*, *The Huguenots in France*, *The Huguenots in England*, and *Industrial Biography*.

Smith, Adam, a Scottish philosopher, was born at Kirkcaldy, in Fifeshire, Scotland, on June 5, 1723. He studied at Glasgow and at Oxford, and was made a professor in the University of Glasgow. He published his *Theory of Moral Sentiments* in 1759, and later a *Dissertation on the Origin of Languages*, both of which had a great vogue in their day. But the work which gives him his reputation, and makes him the founder of the science of political economy, was his *Inquiry into the Nature and Causes of the Wealth of Nations*, published in 1776. Its clear style, startling doctrines, and curious facts, made it popular at first, but when it was seen how contrary its principles were to the old ideas of things, it was vigorously opposed. After the French Revolution and the excitement attending it had passed by, the book became the leader of a great host of literary works based upon it. Smith became Lord Rector of Glasgow university in 1787, and died at Edinburgh, July 17, 1790. See *Life* by Farrer in the "English Philosophers" series, and by Haldane, in the "Great Writers" series.

Smith, Charles Emory, American journalist, diplomat, and United States postmaster-general, was born at Mansfield, Conn., Feb. 18, 1842, and graduated from Union college in 1861. Commencing his career as a newspaper writer he became, in 1865, editor of the Albany *Express*, and in 1870 editor of the Albany *Journal*. In 1880, he removed to Philadelphia, and there conducted the *Press* of that city. He has been president of the New York State Press association, a regent of the University of the State of New York, a delegate to several national Republican conventions, and from 1890 to 1892 was United States minister to Russia. In 1898, he entered President McKinley's cabinet as postmaster-general.

Smith College, located at Northampton, Mass., was founded in 1871 by Miss Sophia Smith, of Hatfield, Mass., who donated about $365,000 for the purpose. It is a college for women, providing courses of study and facilities for education equal to those which are afforded in the best colleges for young men. It stands in the first rank among colleges for women. It has a faculty of 80, and an attendance of 1,133 students.

Smith, Edmund Kirby, a Confederate general, was born at St. Augustine, Fla., in 1824. He was professor at West Point and a major in the United States army. In the Confederate service he became lieutenant-general in 1862, and general in 1864. He was made commander of the trans-Mississippi department in 1863, and managed it so as to make it self-supporting. He invested Cincinnati in the fall of 1863, but withdrew when the veterans under Sigel entered the city. At the close of the war, Gen. Kirby Smith's forces were the last to surrender. He was president of the Atlantic and Pacific Telegraph company from 1866 to 1868, chancellor of the University of Nashville from 1870 to 1875, and afterward professor in the University of the South at Sewanee, Tenn. He died there March 28, 1893.

Smith, Eli, an American missionary, was born at Northford, Conn., Sept. 13, 1801. He sailed as a missionary of the American board to Malta in 1826. He went to Beirut to study Arabic, afterward making a tour through Greece, Armenia, and Georgia to Persia, thus preparing the way for the Nestorian mission. He was the companion of Dr. Robinson in his explorations in Palestine. His work in improving the Arabic type, by making the letters clearer, and more like the written ones, was important. He spent the last years of his life in connection with Dr. Vandyke, in making the Arabic translation of the Bible. He died in Beirut, Syria, Jan. 11, 1857.

Smith, Francis Hopkinson, American artist and author, was born at Baltimore, Md., Oct. 23, 1838, and as a youth studied, and for some years was actively engaged in mechanical engineering. In the latter capacity he performed considerable work under contract for the United States government. He has, however, made his chief reputation as a water-color painter, among his more notable pictures being: *In the Darlink Wood*, *In the North Woods*, and *A January Thaw*. In literature, he has also achieved a reputation, as well as an illustrator. The following works have come from his pen: *Old Lines in New Black and White; A White Umbrella in Mexico; Well-Worn Roads; Colonel Carter of Cartersville; A Book of the Tile Club; A Day at Laguerre's; American Illustrators; Venice of To-day; A Gentleman Vagabond and Some Others; Tom Grogan; Gondola Days;* and *Caleb West*.

Smith, Henry Boynton, an American theologian, was born at Portland, Me, in 1815. He studied at Halle and at Berlin, Germany, after finishing his theological studies at Andover and at Bangor. He was a professor of philosophy at Amherst college, and of church history and later of theology, at Union Theological seminary in New York city. He held this position for twenty years, which, with translations of works on church history, made

him one of the first theologians of the Presbyterian church. He died at New York, Feb. 7, 1877.

Smith, Gold'win, an English writer, was born at Reading, England, Aug. 13, 1823. He studied at Eton and Oxford and was elected a fellow of University college. From 1858 to 1866 he was professor of history at Oxford. During the Civil war in the United States, he wrote several pamphlets in support of the north, and in 1864 lectured in the United States. He was appointed professor of English and Constitutional history at Cornell university, Ithaca, N. Y., in 1868. Since 1871, he has lived in Canada, where he has edited the *Canadian Monthly*, and founded and edited *The Week* and *The Bystander*. His writings, which are marked by vigorous thought, an incisive and brilliant style, and remarkable powers of compressing much into little space, yet with great lucidity, and the quality of highly interesting the reader, embrace: *Irish History and Irish Character; Lectures on the Study of History; Three English Statesmen; The United States*, an *Outline of Political History (1492–1871)*; *The United Kingdom, a Political History; Lectures and Essays; A Trip to England; Bay Leaves; Guesses at the Riddle of Existence;* and biographies of *Wm. Lloyd Garrison, Wm. Cowper*, and *Jane Austen*.

GOLDWIN SMITH.

Smith, Captain **John,** the founder of Virginia, was born in Lincolnshire, England, in 1580. He traveled in France and the Low countries, and when on his way to join the Christian army fighting against the Turks in Hungary, was robbed by four adventurers. He joined a ship, half merchant and half pirate, and helped to capture a Venetian argosy. He distinguished himself in the service of Ferdinand, duke of Austria; was next sold as a slave, but escaped and traveled through Germany, France, Spain, and Morocco. In 1605, he joined an expedition of three vessels and 105 men, to found a colony in Virginia. On the way out he was accused, by the leaders, of a conspiracy to make himself king of Virginia, and was kept a prisoner on the voyage. Jamestown was founded on the James river in April, 1607. Smith, after being tried and acquitted, was made a member of the council, and was the real head of the colony, saving it from destruction. On one of his journeys into the country for corn he was captured by the Indians, under the chief Powhatan, and his life saved by the chief's daughter Pocahontas. The story, however, has been doubted by late writers. On his return to Jamestown he found the colony reduced to about forty men, who were anxious to return to England, but were induced by Smith to remain until others arrived. He explored the coasts of the Chesapeake bay in two voyages, traveling about 3,000 miles, and making a map of the country. He was superseded in 1609 as governor of the colony by Lord Delaware, and returned to England. In 1614, he explored the coasts of New England, making a map of the country, which he presented to Prince Charles. He undertook the founding of a colony in New England in 1615, but his vessel was captured by a French war ship, and he was carried to La Rochelle. After his escape, he wrote an account of his voyages to New England. He wrote also *General Historie of Virginia, New England and the Summer Isles*, and the *True Travels, Adventures, and Observations of Captain John Smith*. See *Life*, in Sparks' "American Biography." He died at London, June 21, 1631.

Smith, Samuel Francis, an American clergyman, was born at Boston, Mass., in 1808. He served as pastor of a Baptist church in Waterville, Me., and at Newton, and Boston, Mass., edited the *Christian Review* and other Baptist periodicals. He is known as the author of several hymns, but especially of the national hymn, *My Country 'tis of Thee*, which he wrote in 1832, while a theological student at Andover. A Baptist hymn book contains twenty-seven of his hymns. He died Nov. 16, 1895.

Smith, William Robertson, a distinguished Scottish divine, biblical scholar, and orientalist, was born in Aberdeenshire, Scotland, Nov. 8, 1846, and died at Cambridge, England, March 31, 1894. Educated at Aberdeen university, he studied theology at Edinburgh, and at Bonn and Göttingen, and was elected to the chair of Hebrew and Old Testament exegesis at the Free Church college, Aberdeen. While here, he contributed some articles of an advanced character on the Bible for the *Encyclopædia Britannica* adverse to the "standards" of the Free church, which provoked much controversy and led to a prosecution for heresy. Owing to a skillful and powerful defense and to the spread of broader views of biblical criticism and the latitude allowed a writer on questions of inter-

WILLIAM ROBERTSON SMITH.

pretation, the trial was inconclusive, though subsequently (in 1881) he was removed from his chair, but left with its emoluments. This occurred in consequence of Professor Smith writing his later articles for the *Encyclopædia Britannica* on Hebrew language and literature. During his suspension he traveled in Egypt and Arabia, and on his return he became associated with Prof. T. Spencer Baynes in the editorship of the *Encyclopædia Britannica*. In 1883, he became lecturer on Arabic at Cambridge and subsequently professor at that university. The works of this fearless investigator and writer embrace: *The Old Testament in the Jewish Church*, *The Prophets of Israel and their Place in History*, *The Religion of the Semites*, *Fundamental Institutions*, and *Kinship and Marriage in Early Arabia;* also a volume on Isaiah for Professor Perowne's *Cambridge Bible for Schools*.

Smith, Syd'ney, an English author, was born in Essex, England, June 3, 1771. He studied at Oxford and was curate at Netheravon where he became tutor to a young man intending to study in Germany, but the war prevented and sent them to Edinburgh. Here, in 1802, with Jeffrey, Horner, and Brougham, he started the *Edinburgh Review*, writing eighteen articles in the first four numbers. He next lived six years in London, where he made his mark as a lecturer on philosophy, a preacher, and a brilliant talker. The archbishop of York gave him the parish of Forton in Yorkshire, where there had not been a resident clergyman for 150 years, a town, as he described it, "twelve miles from a lemon," but where he lived twenty years as "village parson, village doctor, magistrate, and Edinburgh reviewer." He was afterward made rector of Combe Florey in Somerset and a prebendary at St. Paul's, London. He wrote in all sixty-five articles for the *Edinburgh Review*, *Peter Plymley's Letters*, in favor of Catholic emancipation, and letters and pamphlets on the ballot, the game laws, prison abuses, etc. He is best known, however, as a wit, and the creator of "Mrs. Partington." He died Feb. 22, 1845. See *Life and Letters*, by Holland; *Life and Times of Sydney Smith*.

Smith, Sir **Will'iam Sid'ney,** the hero of Acre, was born at Westminster, England, July 21, 1764. He entered the navy at 11 years of age, and was made lieutenant when only 16 for his courage at Cape St. Vincent. He became captain in 1782; was sent to Constantinople on a mission, and was with Hood at the burning of the ships and arsenal at Toulon. Taken prisoner at Havre de Grâce, he succeeded in making his escape in 1798, and was sent as minister to Constantinople. From here, learning that Bonaparte was about to attack St. Jean D'Acre, he hastened there in command of a squadron. He captured the enemy's vessels in March, 1799, and held the town until Napoleon raised the siege, leaving his guns behind. He was rewarded with a pension of $5,000, and the thanks of parliament. As rear-admiral, in 1805, he guarded Sicily and Naples, destroyed the Turkish fleet in Abydos, 1807, and blockaded the Tagus. He was made vice-admiral in 1810, and admiral in 1821. His death occurred at Paris, May 26, 1840. See *Life*, by Barrow.

Smith, Sir **William,** an English classical scholar and for many years editor of the London *Quarterly Review*, was born at London in 1812 and died Oct. 7, 1893. His name will be familiar to most students by his many compilations—chiefly by his *Dictionary of Greek and Roman Antiquities; Dictionary of Greek and Roman Biography and Mythology; Greek and Roman Geography; Latin-English Dictionary; Dictionary of the Bible; Dictionary of Christian Biography*, and *Dictionary of Christian Antiquities*.

Smith'field or **Smooth'field,** is an open space of nearly six acres in London, and has been used for centuries as a market for sheep, horses, cattle, and hay. It was outside the city walls, and could be used for jousts, tournaments, and executions. The well-known Bartholomew fair was held here; Wallace, the patriot, was executed here by Edward I.; Wat Tyler, with 30,000 peasants, here met Richard II., and was stabbed by the mayor of London. It is best known, however, as the place of execution of the long line of English martyrs from 1401 to 1612. The cattle market, well described in *Oliver Twist*, was closed in 1855. The hay market still occupies a part of the space, but the center is laid out as a garden with fountains.

Smithso'nian Institu'tion, a scientific establishment, which was organized by congress in 1846, to carry into effect the will of James Smithson. He was an Englishman, born in 1765, who devoted his life to scientific pursuits, and bequeathed his estate of $515,169 to the United States, to found "at Washington an establishment for the increase and diffusion of knowledge among men." The original bequest has, through subsequent additions, now reached the amount of $900,000, to the interest upon which congress adds an annual appropriation of about $20,000. The institution is governed by a board of regents appointed by the government. It has large and beautiful buildings filled mainly with the national collections. The principal work of the institution is in the direction of original research, Professor Henry, the first secretary, making the rule that nothing should be undertaken by it which could be done as well somewhere else. Its library of 100,000 volumes has been united with that of congress, and its art collection was transferred to the Corcoran public art gallery. There is in its buildings, the national museum, a bureau of ethnology, and a bureau of international ex-

change; also connected with it are a national park and an observatory. It publishes *Smithsonian Contributions to Knowledge*, *Miscellaneous Collections*, and an annual report. It carries on communication between the library and scientific associations in Europe and America, and has a vast correspondence with all parts of the world.

Smoke, the vapor produced by burning any substance, usually wood or coal. The smoke from burning wood is almost colorless, and consists mainly of carbonic acid and water, while that from burning bituminous coal is darker, being mixed with an oily vapor and soot, or finely divided carbon. The more perfect the combustion, the less smoke; and the great effort in large cities to remove the smoky atmosphere which results from the large amount of smoke coming from factories and foundries and innumerable fires, is mainly in the direction of perfecting the combustion of the coal used. If coal is heated in a close vessel, the oil, tar, and gas, which are formed in the process of combustion, are all driven off consumed, leaving a coke which burns with a smokeless flame, as does also anthracite coal, which has lost the original volatile matter of the coal by natural processes. The need of some practical invention to do away with the smoke of a large city is seen in the black fogs of London, when the moisture of the air absorbs the black, oily particles of smoke, and, growing heavier, settles down in a dark mass, almost putting an end to the vast traffic of the city.

Smoll'ett, Tobias George, a Scotch historian and novelist, was born at Dalquhurn, Scotland, in 1721. He studied medicine and served an apprenticeship with a doctor and apothecary, afterward obtaining a medical degree. He went to London in 1739 and attempted to put his tragedy of *The Regicide* on the stage, but failed, and went as surgeon's mate on the *Cumberland*, which took part in the expedition to Carthagena in 1741. Both these experiences he describes in *Roderick Random*. His first publication was *Advice, a Satire*, in 1746. *Roderick Random* appeared in 1748 without his name, and was a great success, as was also the *Adventures of Peregrine Pickle* in 1751. As editor, in 1756, of the *Critical Review*, he became involved in various difficulties, ending in imprisonment for three months for libel. His *History of England*, from the invasion of Julius Cæsar to 1748, was begun in 1756, four volumes being written in fourteen months. The continuation of the history, bringing it down to 1764, is better known than the first part, forming as it does the continuation of Hume's history. His historical works brought him $10,000. His *Travels through France and Italy* were written after a two years' sojourn on the continent. In a village called Monte Novo, near Leghorn, where he had gone for his health, Smollett wrote his last and best novel, *Humphrey Clinker*, which was published in 1771. He lived only long enough to hear the first rumors of its success, dying Oct. 21, 1771. See *Life*, by Hannay, in the "Great Writers" series.

Smug'gling is the bringing into a country goods liable to duty, without payment of the government dues, and also the evasion of taxes on goods by illegal or secret manufacture. The business of smuggling was carried on largely in early times in England and on the continent, and the stories of the adventures of those engaged in it form a large part of old romances, as in Scott's *Guy Mannering* and *Redgauntlet*. Tea, brandy, silks, and tobacco were the articles brought into England by smuggling, at one period one-half the silks sold paying no duty, and three-fourths of the tobacco used in Ireland escaping the tax. The introduction of free trade in England has made the business no longer profitable The enormous coast line of the United States makes the evasion of custom duties easy, and the long frontier of Canada and the Mexican border also offer opportunities of introducing contraband goods; but smuggling is carried on largely through the regular channels of trade, and under the eyes of the customhouse inspectors, in spite of very careful watching. The schemes for carrying it on are innumerable, women being especially skillful in their evasions. Goods are concealed about the person, as in the hair and in false calves on the legs, in canes and secret pockets, and quilted into skirts or vests. Seizures of large amounts are often made, but the hope of success, and the profits of one successful venture, keep up the practice. The illegal manufacture of spirits has been carried on mainly in the mountainous districts of the south, and the adventures of the revenue officers in those regions afford considerable material for romance.

Smut (in plants), a common disease of the grains of many cereals, as corn, rye, etc., caused by the presence of a parasitic fungus. See ÆCIDIOMYCETES.

Smyrna (*smẽr'nä*), an important seaport in Asiatic Turkey, at the head of the gulf of Smyrna. The gulf runs inland from the Ægean sea for forty-six miles. The city climbs up the slopes, and nestles at the foot of a steep hill, on the summit of which are the ruins of the ancient Greek Acropolis. The streets are narrow and dark, the drainage bad, the climate very hot in summer, and earthquakes are not uncommon. There are some ruins of ancient walls, a theatre, and temples, and a large number of modern mosques, churches, and bazaars, but no fine buildings. Its population of 201,000 contains a large Turkish element, though numerous other races are represented. The Koran encourages public education; so that schools have long been established there, while public

libraries are connected with certain of the chief mosques. It has manufactures of carpets, cotton and woolen goods, and pottery, iron foundries, and machine shops. Its importance, however, is from its commerce, as it has the largest part of the trade of Asia Minor with Europe. It exports raisins, figs, opium, carpets, sponges, licorice, olive oil, tobacco, walnut wood, emery, and poppy seed; and imports cloths, timber, iron, butter, cheese, petroleum, glass, and paper. There is a fine harbor, which is entered annually by over 1,600 vessels. Smyrna, originally peopled by Greek immigrants to Asia Minor, became Ionian before 688 B. C., and was then one of the great trading places of the east. The king of Lydia destroyed it in 630 B. C., and it was more than 300 years before it was rebuilt on a new site. Under the Romans it regained its importance, though rivaled by Byzantium, to whose emperors it belonged. Destroyed by Tamerlane in 1402, it was captured by the Turks in 1424.

Snail, a shelled mollusk belonging to the class *Gasteropoda*. The land snails are widely distributed and are well known. They are air breathers, and, feeding upon vegetation, do much injury in gardens. The animal is spirally coiled so as to fit into its shell. The lower part of the body called the foot can be protruded. There are four tentacles or feelers on the head which can be shortened or extended at will. The longest pair have eyes in their tips. There are slender muscles attached to the apex of the shell and to the animal's foot, by means of which the animal is drawn into its shell. In dry weather or in winter, the opening is often closed by a horny structure, called the operculum. There are an immense number of land snails in tropical countries of considerable size and bright colors. Some of them are tree climbers and secrete a thread of mucous substance, by means of which the body is suspended like that of a spider by its thread. They are eaten as food, especially in Europe. There are also water snails, some of which come to the surface to breathe air, and others which are provided with gills. The common garden snail has 135 rows of 105 teeth each, making 14,175 in all.

Snakes, the largest class of reptiles, the representatives having an elongated body covered with scales. They have no limbs, and no rudimentary bones representing the shoulder arch, but there is a trace of the arch of the hind limbs. They move by pushing the edges of the ventral scales against roughnesses, but can make no headway on a smooth surface. The bones of the skull and jaws are movable, so that the latter can be put on a stretch, which enables the snake to swallow animals larger than the normal size of the mouth and throat. Some possess poison fangs with which their prey is killed, while others coil around their prey and crush it. They shed their skins periodically, and the deserted skins are often seen in fields and woods. Some live entirely on land, though most snakes swim well, others climb trees, and, in the Indian ocean are snakes living habitually in the water. Most of them lay eggs, but a few, including the last mentioned ones, bring forth their young alive. The snakes naturally fall into two groups, the non-poisonous and the poisonous ones. There are about 700 species of non-poisonous or colubrine snakes, which are found in nearly all parts of the world. They are well represented in the United States, and include such familiar forms as garter snakes, blue racers, grass snakes, and blow adders, all of which are harmless. The venomous snakes are represented in the United States by the rattlesnake family. There are about 60 species in this family, all American, and renowned for their venom. Besides rattlers are included the copperhead and water moccasin, the latter being the most dangerous of our snakes. The anacondas, boas, and the like, are powerful non-poisonous snakes. All snakes are more abundant in warm and tropical countries. India is noted for venomous snakes, like the cobra, and the annual number of deaths from snake bites there reaches above 20,000. See BOA, COBRA, MOCCASIN, RATTLESNAKE.

Snake River, the largest branch of the Columbia river. It rises among the Rocky mountains, near Wyoming, and in crossing southern Idaho forms the Shoshone falls, and a part of the northern boundary of Idaho. In southern Washington, as the Lewis river or fork, it joins the Columbia, having made a journey of 1,050 miles. It is navigable for only 160 miles.

Snipe, a common name for a number of favorite game-birds belonging to a group of

SNIPE.

shore birds. They grade into the sandpipers. There are about 100 species, and 30 of these visit the United States mainly during migration. A number of snipes, however, nest within the United States. Among the

more widely known forms are the woodcock, the jack-snipe, the tip-up, and Wilson's snipe. The jack-snipe is the pectoral sandpiper, and the tip-up the spotted sandpiper. The American woodcock is about eleven inches long, and variegated with black, brown, gray, and russet colors. The European woodcock is similar, but considerably larger. The American bird frequents low, wet woods and in the fall visits corn fields and wooded hillsides. They probe for earthworms with their long bills, making holes in clusters. Wilson's snipe is about eleven and one-fourth inches long, and is a favorite game bird. They live in fresh-water marshes and meadows. The tip-up, or teter snipe, is about seven and one-half inches long, and has a white breast spotted with black. The jack-snipe is abundant during migrations. Snipes are also abundant in the Old World.

Snow is water floating in the atmosphere in a crystallized state. When a cloud of water

vapor reaches a temperature below o° C. the process of freezing begins; and, if the air be calm, the crystals thus formed are large and regular. They are most easily observed by collecting them on a piece of black velvet and examining them with a lens. In the accompanying figure are shown the forms of some typical crystals, recently prepared from microphotographs by the United States Weather bureau. The whiteness of snow results from the total reflection of light, which occurs, sooner or later, when a ray of light enters any considerable body of snow from any direction. By the *snow-line*, or limit of perpetual snow, as it is sometimes called, is meant the height above the sea level at which snow does not melt, even in the hottest summers. This elevation varies greatly with the latitude and with local circumstances. In general, it diminishes with the latitude. Snow does not, however, collect to an indefinitely great depth, even in regions which lie entirely above the snow-line; for the pressure soon reaches a point where the snow is compressed into ice and "flows" off as a glacier. See Tyndall's *Forms of Water* (International Scientific series.)

Snow'berry, a common shrub, native of North America, belonging to the honeysuckle family. It receives its name from its white, waxy berries, which remain on the bush after the leaves have fallen, and make it an ornamental shrub.

Snow Bird or **Jun'co,** a sparrow-like bird very common in the United States during winter. They are about six and one-half inches long, with the upper parts slate gray and the lower parts whitish. They are often seen in flocks from ten to fifty on the ground near evergreens. They nest north of New England.

Snow'bunt'ing or **Snow'flake,** a bird about seven inches long, nesting in the far north and, in winter, visiting the United States as far south as the Ohio river. In the breeding season, they are pure white, with black on their wings and tail, and black feet and bill. The

SNOWBUNTING.

winter plumage changes, and the white on the body is clouded with clear, warm brown, and the bill becomes pale. They appear in flocks on the ground and perch on fences, but rarely on trees. With the snow birds they belong to the finch family.

Snow'drop, a class of plants of the same order as the amaryllis. It is a spring flower, with a white, drooping bell, which gives it its name, from its resemblance to a lady's earrings, or drops, as they were called in the 16th century. The root—a bulb—has two or three narrow leaves and a long stem with a single flower.

Snow'shoes, a very broad, flat shoe, used in cold countries for walking on snow. The broad surface keeps the foot from sinking into the snow. The snowshoe worn in Canada is shaped somewhat like a tennis racket, with a short handle, and is from three to five feet long, and from one to two feet wide. It is a wooden frame with a leather covering, upon which the foot is fastened by thongs. The Norwegian snowshoe, called "ski, is a wooden runner, about four inches wide and eight feet long, turning up in front.

Soap is a compound of soda or potash and fat, potash making a soft soap, and soda a hard soap. The principal fats used are

tallow, lard, olive oil, and cocoanut oil for hard soaps, and besides these, linseed oil, fish oil, and castor oil are used in soft soaps. The distinctive property of soap is its power of cleansing, though to what it owes this power has never been decided. It will dissolve in water and in alcohol, and when shaken in water forms a foam or "lather." Soap is made by boiling the fat or oil with a solution of soda or potash, the length of time and the strength of the solution or lye varying with the kind of soap. Yellow soap usually contains rosin. Toilet soaps are made of good yellow or curd soap, the finest being subjected to a process called "milling." The soap is cut into shavings, dried a little, coloring matter and perfumes are added, and then passed between granite rollers and afterward pressed into bars, from which the cakes are cut and stamped. Transparent soaps are made by dissolving common soap in alcohol, pouring off the solution and getting rid of the most of the alcohol by distillation. Soap improves with age, growing harder and dissolving more slowly.

Sobieski (*sō-bē-ĕs'kē*), or **John III.,** king of Poland, one of the greatest soldiers of the 17th century, was born in Galicia in 1624. At that period, Poland was carrying on wars with the Russians, the Tartars, and the Turks, in all of which he distinguished himself, defeating the Turks, especially at Choczim, Nov. 11, 1673, killing 20,000 soldiers. He was chosen king of Poland in 1674, and made it his business to oppose in every way the Turkish power then threatening all Europe, routing them at Lemberg in 1675, resisting successfully their attacks on his camp near the Dniester in 1676, and after a five years' truce, hastening to the relief of Vienna, he drove back their army of 100,000 soldiers, Sept. 12, 1683. Sobieski was fond of books, and a fine scholar as well as a shrewd statesman. He died June 17, 1696.

Soci'ety Islands, a group of islands in the Pacific ocean, divided into two groups, the Tahiti islands and Society islands proper. The Tahiti group belong to the French and consist of five islands. They are of volcanic origin and mountainous, the loftiest point on the island of Tahiti being 7,339 feet high. They have a healthful and mild climate and fertile soil, producing the guava, breadfruit, oranges, lemons, and other tropical fruits. The chief industries are the preparation of copra, sugar, and rum, which, together with vanilla and mother of pearl, form its chief exports. Pigs, dogs, and rats were the only animals found on the islands when discovered, but all domestic animals have been introduced. The people are Malays. The Spanish and English both claimed the discovery of the islands, Captain Cook in 1760 giving them their name. Through the labors of English missionaries the islands, then under Queen Pomare, were Christianized in 1815. The efforts of French Catholic priests to enter the country brought on a dispute with England, and the final establishment of the French authority on the island of Tahiti.

Socrates (*sok'rā-tēz*), a Greek philosopher, was probably born about 460 B. C., near Athens. His father was a sculptor and he is said to have been trained in the same art, and a statue of the Graces at the entrance to the Acropolis was thought to be his work. He served in the army in three campaigns, where his bravery and endurance were praised by his friends. In 406 B. C., he was a member of the senate of 500, and refused, at risk to himself, to put an illegal question to vote. He was short and odd looking, with a flat nose, thick lips, and prominent eyes. He practiced plain living and trained himself to be indifferent to heat and cold, going barefoot and wearing the same clothing the year round. His wife, Xantippe, has been pictured as a scold, and he professed that he married and lived with her as a means of discipline, but a dreamer and reformer is not always the most pleasant companion, and the habits of Socrates must have been at least somewhat trying to an orderly woman.

In middle life he devoted himself to the career that has made his name forever famous. He established no school, and did not call himself a teacher, but frequented the public walks, the gymnasia for bodily training, the schools, and the market places, talking with any one that addressed him, in the hearing of the bystanders. He had, strictly, no disciples, though some persons made a habit of being present at his conversations. As Socrates left no writings, it is from two of these friends and listeners, Xenophon and Plato, that we have the accounts of his teachings, though in Plato's writings it is difficult to tell what part of the reported conversations are the words of Socrates and what part Plato himself put into his mouth. Socrates believed that he had a special religious mission, having learned from the Delphic oracle that there was no wiser man than himself, and interpreting it to mean that the highest wisdom was to be conscious of ignorance, and that it was his duty, by questioning all men, to make them wise by teaching them their ignorance. The subjects of his conversations were human nature, human duties, human relations, and human happiness, as being the most practical and necessary to man. Cicero said, "Socrates called down philosophy from the heavens to earth and introduced it into the cities and houses of men." In the year 399 B. C., an indictment was laid against Socrates, "for not worshiping the gods whom the city worships and for introducing new divinities of his own; next, for corrupting the youth." Plato's *Apology* gives the substance of his defense, a vindication of his whole life, but not given in a way to conciliate the jury of over five hundred Athenian citizens. The vote of con-

demnation was carried by a small majority, though the sentence of death by poisoning was passed by eighty more votes, provoked probably by his apparent indifference to their judgment. The execution of the sentence was delayed for thirty days. Socrates, refusing to escape, as his friends urged him to do, spent his last day in discoursing on the immortality of the soul. In the evening he drank the hemlock, and still talking to his friends, calmly watched the poison doing its appointed work. "Such was the end," says Phædo, "of our friend, whom I may truly call, the wisest, the justest, and best of all the men whom I have ever known." See *History of Greek Philosophy*, by Zeller.

So'da is a compound of sodium and oxygen, the oxide of sodium, sometimes called a mineral alkali. It forms with acids what are known as soda-salts. The soda of commerce is one of these salts, a compound of soda and carbonic acid, and is called sodium carbonate, carbonate of soda, or sal-soda. It is in large crystals, which dissolve in water, and turn to powder in the air. It is sometimes found as a white powder on the top of the ground on the alkali plains of the west, and also in the nitrate lakes of Hungary and Austria, and in springs in Iceland and North America. It is manufactured largely from sea salt, and has been obtained from the ashes of sea plants. It is used in washing and in making soap. The soda used in cooking is usually the bicarbonate of soda. It is prepared by adding carbonic acid gas to the carbonate of soda, in different ways, sometimes making a solution of the soda, and saturating it with the gas, and again by sending a current of the gas over the crystals of soda, and also by a chemical process which takes place when common salt, carbon dioxide, and ammonia are brought together. Caustic soda is made by mixing milk of lime, which is slaked lime stirred up with water, with a solution of carbonate of soda, filtering and evaporating the liquid to dryness. This is made use of in soap making, and in many other chemical industries. There are many other sodium or soda salts, such as the sulphate, called Glauber's salts, the phosphate, the nitrate, and sodium chloride or common SALT, which see.

Sodium (*sō'dĭ-ŭm*) is a metal very much like potassium, of a bluish-white color, and burns with a yellow flame. The compounds of sodium are the only form in which it is found in nature, such as borax, soda-felspar, and especially the chloride of sodium, which is common salt.

Sod'om and Gomor'rah, two cities mentioned in the Bible, and thought to be on the southern shore of the Dead sea. The Scripture account represents them as being destroyed by a shower of fire for the great wickedness of these cities, and the popular belief has assumed that the waters of the Dead sea cover their sites.

Sofia (*so-fē'ä*), the capital of Bulgaria since 1878, stands in a valley of the Balkans. It has been improved since 1891, the old Turkish city with its tumbledown houses and crooked streets being replaced by new French houses, wide boulevards, fine public buildings, and electric lights. A railroad connects it with Vienna and Belgrade. It is the seat of the National university, which supports three faculties of forty-two professors and lecturers, and has an attendance of about 400 students. The city also has a free public library. Its trade is mainly in corn, hides, and wheat. Its hot mineral springs have been celebrated for centuries. Sofia was known as Serdica by the Romans, and was the seat of a famous council in 343. It belonged to the Bulgarians from the 9th century until 1382, when it was captured by the Turks. It 1878, it was occupied by Russia. Population 46,593.

Soils, the different forms of earth on the surface of the rocks, formed by the breaking down or by the weathering of rocks. The soils will vary with the minerals in the rocks, the principal ones being quartz, felspar, clays, mica, and limestone. When the soil is made from the rocks in their original position, they are called sedimentary, but if formed from rocks above them and carried to them, they are known as transported soils. When the soil is carried by glaciers it forms drift soils, and when carried by running water it is known as alluvial soil. They are also known as clays, loams, etc. A mixed soil or loam is usually better than a clay or a sandy soil. The plants grown in the soil take from it from 200 to 600 pounds per acre yearly of the minerals found in it, and the passage of water through it also carries away other quantities, so that where crops are removed, the soil would gradually lose its power of supporting plant life, were it not enriched. This is done naturally by the gradual decomposition of the minerals composing the soil, and also by the artificial process of applying manures and other fertilizers. Another mode of overcoming the difficulty to some extent is by changing the crops grown as the different kinds of crops take up the ingredients of the soil in different proportions.

So'lar Mi'croscope, a modified form of magic lantern, not much used now that gas lanterns and electric lanterns have become so easily available. The only essential difference between the solar microscope and the ordinary magic lantern is that in the former, a beam of sunlight, reflected from a heliostat or porti-lumiere, is employed instead of oil, gas, or the electric arc, for the purpose of illuminating the slide.

So'lar Sys'tem, a term used in astronomy to include the sun, planets, satellites of planets, asteroids, and any "captured" bodies such

as possibly periodic comets. See SUN, PLANET, ASTEROID, MOON, ASTRONOMY.

Solferino (*sŏl-fer-ē'nō*), a village of northern Italy, nineteen miles from Mantua. It stands on a hill with a high tower, called the "Spy" of Italy, from which can be seen the whole plain of Lombardy. It is noted as the scene of the defeat of the Austrian forces by the French and Sardinians, June 24, 1859. The battle lasted sixteen hours, the Sardinians commanded by Victor Emmanuel, the French led by Napoleon III., and the Austrian forces by the emperor, Francis Joseph. The Austrian loss was 20,000, and that of the allied troops 18,000. On June 24, 1870, the bones of the dead on this field were collected in the presence of representatives of France, Italy, and Austria, and buried in three great sepulchres.

Sol'omon, the third king of Israel, the son of David, and his successor. He reigned forty years, from 993–953 B. C., and was famous for his wisdom as well as for his splendid court. His father left him a large army and a full treasury, which he used in keeping peace with the neighboring nations, and in building fine palaces and the temple, the chief glory of his reign. He extended the trade of the country, sending out his fleets and caravans, which brought back gold, gems, and precious woods from Ophir, and horses for his chariots from Egypt. His great wealth, however, came from heavy taxation, and he built altars for the idols worshiped by his heathen wives, which caused the nation after his death to revolt against his son, and ended in the division of the kingdom. The writings that bear his name are the book of Proverbs, Ecclesiastes, and the Song of Solomon, though Ecclesiastes probably belongs to a much earlier period.

Sol'omon's Seal, a species of plants of the lily family, and related to the asparagus. The plant grows from one to four feet high, with broad green leaves, without stems, and drooping, greenish flowers, followed by small black or blue berries. It is found wild in many parts of North America and in Europe.

So'lon, the ancient Greek lawgiver, and one of the "seven wise men," was born about 638 B. C. Though tracing his descent from the royal family of Attica, he had to resort to trade to restore the wealth his father had squandered. He was known as a writer of verses, one of his finest elegies having been quoted by Demosthenes, and several quotations being found in a work of Aristotle's. The beginning of his political career was the Megarian war. The Athenians had several times failed in their efforts to capture Salamis, and had forbidden, on pain of death, any citizen to renew the attempt. Solon, by feigning madness, aroused the people by his poem, and war was declared, with Solon in command, who succeeded in winning Salamis for Athens. He was made archon, or chief ruler, in 594, when the country was in danger of a conflict between the nobility and the peasants. The constitution of Athens, such as had never existed before, was the great work of Solon, and made property and not birth the title to citizenship, the aim being to give the lower classes some control of the law. The laws of Draco were repealed except those against murder; no man could be imprisoned for debt; a limit was placed on the ownership of land; and laws against luxury in food and dress were made. These laws, written on pieces of wood, were preserved in the Acropolis and the people bound themselves by oath to observe them for ten years. Solon traveled then in Cyprus, Asia Minor, and Egypt, meeting Crœsus, king of Lydia, whom he offended by his answer to his question "Who was the happiest man in the world?" Solon replied that it was Tellos, an Athenian who had died for his country. Crœsus asked the question again, thinking to hear his own name in answer as the possessor of great wealth, but Solon gave the place to two Argive youths whom the gods permitted to die in their sleep as a reward for an act of kindness. His last years were passed at Athens, where he opposed unsuccessfully the usurpation of his kinsman Pisistratus. He died about 558 B. C., leaving a command that his ashes should be scattered over the "lovely isle" of Salamis. See *Histories of Greece* by Grote, Curtius, and Cox.

Sol'way Firth is an inlet of the Irish sea, lying between England and Scotland. It is thirty-six miles long and receives the waters of the Derwent and Eden on the English side, and of the Esk, Dee, and Annan on the Scottish side. Near Annan the Solway Firth is crossed by a railway bridge 5,880 feet long, which, built in 1866–69, was almost destroyed by floating ice in 1881. The scenery of the region is painted by Scott in *Redgauntlet* and *Guy Mannering*.

Solyman (*sŏl'i-man*) **I.,** or **Sulei'man II.,** called the "Magnificent," was the greatest of the Turkish sultans. He was born in 1490, and succeeded his father, Selim I. He made many reforms in the internal government of his empire and was known as a patron of learning and of arts. Abroad, he began by extorting in 1521 the tribute refused him by the king of Hungary, and overcoming the Knights of St. John at Rhodes, after a siege of six months, and the loss of nearly 100,000 men. At the battle of Mohács, in August, 1526, he destroyed the Hungarian army, killing King Louis, and, marching on, captured Buda and Pesth. In 1529, he drove Ferdinand of Austria out of Buda, losing 40,000 soldiers in a vain attack on Vienna. He conquered large portions of Armenia and Persia, and the whole of northern Africa except Morocco. A truce, made in 1562, finally left Hungary and

Transylvania to Solyman. He died in 1565, while besieging a small fortress in Hungary.

Somaliland (*sō-mä'lē-länd*), a peninsula on the east coast of Africa, projecting into the Indian ocean, has an area of about 318,000 square miles. It is divided under Italian, British, and French protectorates and the kingdom of Abyssinia, by far the largest portion, however, being controlled by Italy. Game and wild animals abound, but the country is dry, though it produces in some parts grasses, palms, and cacti. The people, numbering about 800,000, are Mohammedans and live by their herds of cattle, camels, horses, and goats, and a trade in myrrh, frankincense, ostrich feathers, coffee, and salt. The British area, 68,000 square miles in extent, has for its chief town Berbera (population 30,000).

Som'erville, a city in Massachusetts, is a suburb of Boston, about two miles from the state house. It has manufactures of flour, leather, iron, and bricks, and slaughter houses, bleaching works, iron foundries, and many fine residences. Population 61,643.

Som'erville, Mary (Fairfax), a Scotch scientist, was born at Jedburgh, Scotland, Dec. 26, 1780. An algebraic sum in a magazine of fashions first interested her in the study of mathematics, in which she afterward became famous. Her first husband, Captain Greig, was Russian consul in London, where she lived for two years until his death. The six years before her second marriage with Dr. William Somerville, she spent in study at Edinburgh. Going back to London in 1812, she attracted attention by some experiments on the violet rays of the solar spectrum, the results being published in the *Philosophical Transactions* of 1826. Lord Brougham asked her to put into popular form Laplace's great work on *Celestial Mechanics*, which she did, publishing her book under the title, *Mechanism of the Heavens*, in 1830. She was granted a pension in 1835 and made a member of the Royal Astronomical society of England and of many foreign societies. She was in favor of "woman's rights" and woman suffrage. When ninety-one years old she still spent five hours a day in mathematical studies. Other works published by her are *Connection of the Physical Sciences*, *Physical Geography*, and *Molecular and Microscopic Science*. She died at Naples, Nov. 29, 1872, having lived in Italy for many years. See *Life*, by her daughter.

Son'net, The. We owe the sonnet, in its structure and design, to Italy; though since Shakespeare's day and that of the early English sonneteers, Sir Thomas Wyatt, the earl of Surrey, and Edmund Spenser, down to the time of Wordsworth, Cowper, Byron, Keats, and Shelley, and the modern English and American bards, the sonnet has always had a peculiar fascination for poets of the first class. The Italian sonnet was written in its perfection by Petrarch, Tasso, and Dante; and though the form of the Petrarchian sonnet has been closely followed by English poets, the Shakespearean form has been a keen rival to it — both dominating other rhyme arrangements of this artistic, poetic form of fourteen rhymed or partially rhymed verse. "The Italian sonnet consisted of fourteen lines, divided into two groups of eight and six lines respectively; the first eight (called the octave) having only two rhymes between them — the first, fourth, fifth, and eighth, being in one rhyme, and the second, third, sixth, and seventh being in the other. There was then a pause in the sense, and the six concluding lines (called the sestette) had two rhymes between them, those rhymes generally alternating in the most finished specimens. In this form of sonnet, Wyatt and Surrey wrote; but since then, the only fixed rule in regard to the English sonnet has been that it should consist of fourteen lines. The great English masters of this form of verse have all differed in their arrangement of the rhymes. Spenser divides the fourteen lines thus: — The first and third lines rhyme one way; the second, fourth, fifth, and seventh another; the sixth, eighth, ninth, and eleventh another; and the tenth and twelfth another, the last two lines forming a couplet with another rhyme. Shakespeare's sonnets consist simply of three quatrains and a couplet, the rhymes being seven in number. In Milton's sonnets there is the classic division into octave and sestette, the former being properly carried out, but the latter being fitted with three rhymes — the ninth and twelfth, tenth and thirteenth, and eleventh and fourteenth rhyming together." Wordsworth is admittedly the greatest of English, modern sonneteers, some of his sonnets, for exalted feeling as well as for felicity of fancy and of diction — such as those dedicated to liberty, and his ecclesiastical sonnets — including not only some of the finest things he ever wrote, but some of the finest that were ever written. Here is one of his sonnets — in its design an apology for and commendation of the sonnet: —

"Scorn not the sonnet; critic, you have frowned
Mindless of its just honors; with this key
Shakespeare unlocked his heart; the melody
Of this small lute gave ease to Petrarch's wound:
A thousand times this pipe did Tasso sound;
With it Camoens soothed an exile's grief;
The sonnet glittered a gay myrtle leaf
Amid the cypress with which Dante crowned
His visionary brow; a glowworm lamp
It cheered mild Spenser, called from Faery-land
To struggle through dark ways; and when a damp
Fell round the path of Milton, in his hand
The thing became a trumpet; whence he blew
Soul-animating strains — alas, too few!"

Sontag (*sŏn'tăg*), **Henrietta,** Countess **Rossi,** a German singer, was born at Coblenz, Prussia, Jan. 3, 1806. She appeared on the stage when only six years old; studied music at Prague, and appeared there at fifteen. She rose to the first rank of European

singers in her brilliant career at Vienna, Berlin, and Paris. After her marriage with Count Rossi, an Italian nobleman, in 1828, she left the stage, but appeared again in 1849, on account of pecuniary troubles. She made a successful tour in the United States, and died at Vera Cruz, Mexico, June 18, 1854.

Soochow (*sō'chou'*), or **Suchau'**, one of the largest cities in China, is fifty miles northwest of Shanghai, on the Imperial canal. It is built on islands, separated by canals. It is a center of the silk manufacture of China, and of printing Chinese literature. It was captured in the Tai-ping rebellion, and retaken by "Chinese" Gordon in 1863, when many of its finest buildings were destroyed. Population 500,000.

Sophocles (*sŏf'ō-klēz*), an Athenian poet, was born in 496 B. C. At sixteen he was chosen to lead the chorus of youths who celebrated the naval victory of Salamis. At the age of twenty-eight, in a dramatic contest, he was awarded the prize which had been given to Æschylus for many years. Only seven of his many dramas are preserved, but these place him at the head of the Greek dramatists. The probable order in which they appeared is *Ajax; Antigone; Electra; Œdipus, the King; Trachiniæn Women; Philoctetes*, and *Œdipus at Coloneus*. *Antigone*, one of the earliest dramas, produced in 440, gained the prize, and so pleased the Athenians that he was made commander with Pericles in the Samian war. There are only fragments and titles of the other plays. He is said to have been beautiful in person, a fine musician and athlete, and a ready wit. His death has been attributed to losing his breath in prolonging his voice in a public reading of *Antigone*, and also to excess of joy at a dramatic victory, but without sufficient authority. He died in 405 B. C., at the age of ninety-one. See *Sophocles*, in Green's "Classical Writers," by Campbell, and *Lectures*, by Schlegel.

Sorbonne (*sôr-bon'*), the earliest and most famous of the colleges of the University of Paris in the middle ages. It was founded in 1253, by Robert of Sorbon, and was the first institution connected with the university that was intended as a place of living as well as of study, as, before this, the great crowd of students of the university had found lodgings wherever they could. It was devoted to the study of theology, and the life was monastic, the students calling themselves "the poor masters of the Sorbonne." It soon became celebrated as the first theological school in Europe, its decision on disputed points was accepted as decisive, and it drew its scholars from all Europe. But when the new learning found its way into France, at the beginning of the 16th century, the Sorbonne, though it had led to the introduction of printing in France, opposed all reform either in study or religion, and lost its position. Its property was confiscated in the revolution in 1792, but the Sorbonne was revived under Napoleon in 1808, and was made the seat of the three departments of the University of France, theology, science, and literature. New buildings were erected in 1884–89, the largest theatre seating 3,000.

Soredia (*so-rē'di-a*) (in plants), minute granules which appear on the surface of many lichens, making them appear powdery. Soredia are scattered by the wind and form new lichens. Each one consists of a few alga cells invested by some fungus filaments. See LICHENS.

Sorghum (*sôr'gŭm*), a plant belonging to the grass family, whose original home is thought to have been the interior of Africa, but it has not yet been found growing wild there. It is nearly related to the sugar cane, and has been cultivated from the most ancient times. It is extensively cultivated in this country for the production of "sorghum molasses," and a large amount of sugar is also manufactured as an incidental product. As a source of sugar, however, it does not compete with the sugar cane and the sugar beet. See SUGAR.

Sorus (*sō'rŭs*) (in plants), a definite group of sporangia, as in the ferns, in connection with which plants the term is chiefly used. See FILICALES.

Sothern (*suth'ern*), **Edward Askew**, an American actor, was born at Liverpool, England, April 1, 1826. His first appearances on the stage in England and the United States were not particularly successful, until in 1858 he assumed the character of "Lord Dundreary" in the comedy, *Our American Cousins*, which was made so rich and entertaining by Sothern's acting that it became famous, the comedy running 140 nights in New York, and nearly 500 nights in London, and again and again repeated at other times. His most successful character next to "Dundreary" was "David Garrick," both characters making his name famous. He died at London, Jan. 21, 1881. See *Memoir*, by Pemberton.

Soudan (*sō-dăn'*), or **Sudan'**, a vast region in Africa, stretching from the Atlantic to the Red sea, and from Egypt and the Sahara in the north to the region of the equator in the south. It is the home of the true negro race. There are three divisions—eastern, western, and central Sudan. Eastern Sudan is sometimes called the Egyptian Sudan, which until 1882 was a province, with Khartum for its capital. It is now divided into six first-class, and three second-class, districts. The regions watered by the Nile are very fertile, yielding great crops of cotton, indigo, sugar, rice, corn, and tobacco. Other parts are bare, though covered with grass in the rainy sea-

son, when they afford pasture to large flocks of camels, sheep, and goats. Other products of the country are ivory, ostrich feathers, gums, india rubber, iron, gold, honey, and wax. Egyptian Sudan covers 950,000 square miles, and has a population of about 10,000,000. The Egyptians for fifty years after 1819 extended their power over the regions around Khartum, but in 1877, and again in 1882, the native tribes rebelled. General Gordon, sent out by the English government to the help of Egypt, was shut up in Khartum, and his mission ended in disaster. In 1897, the Anglo-Egyptian army again sought to recover the lost provinces, and after two years were successful. A convention between the British and Egyptian governments followed, in which it was agreed that they should govern the Sudan jointly through a governor-general. Khartum is now in railway and telegraphic communication with Cairo, and on Dec. 12, 1899, the Sudan was declared open for general traffic. Western Sudan includes the valleys of the Niger, Senegal, and other rivers draining into the Atlantic, and the countries known as French Sudan, and central Sudan, the valleys of the rivers that drain into Lake Tsad. See *Heart of Africa*, by Schweinfurth; *Sahara and Sudan*, by Nachtigal.

Soult (*sōlt*), **Nicholas Jean de Dieu,** marshal of France, was born at St. Amans-la-Bastide, France, March 29, 1769. He enlisted as a private and was six years in reaching the rank of sergeant, but then rose rapidly. He was for five years, from 1794 to 1799, in constant service in Germany and on the French frontier. He served in command of a division under Masséna in his Swiss and Italian campaigns. In 1802, Napoleon made him one of four consular guards, and in 1804 a marshal of France. He decided the battle of Austerlitz by piercing the Russian center, and was in both the Prussian and Russian campaigns. He drove the British out of Spain and held Portugal until driven out in turn by Wellington. As commander in Spain, he gained a victory at Ocaña, in 1809, and subdued Andalusia. Failing to enlist Joseph Bonaparte in his plans, he asked to be relieved of his command, but was sent back by Napoleon after the battle of Vittoria, as the only commander who could turn back the tide of disaster, and successfully meet the strategy of Wellington with his own brilliant tactics. He became a royalist, when Napoleon had abdicated, but went back to him on his return from Elba. He was banished after Waterloo, but in a few years was restored to his former honors. In 1838, at the crowning of Queen Victoria, he was sent as an ambassador to England, and warmly met by his old opponent, Wellington. His last honor was the title "Marshal General of France." He died Nov. 26, 1851. See *History of the Peninsular War*, by Napier.

Sound. See ACOUSTICS.

Sound, The, a strait which forms the passage from the North sea to the Baltic. It is fifty miles long, and lies between Sweden and the island of Zealand. From the 15th century until 1857, all vessels passing through The Sound, with a few exceptions, paid toll. By the treaty of March 14, 1857, these Sound duties were abolished, about $16,000,000 being paid to Denmark, which agreed to keep up the lighthouses on the coast. Nelson forced the passage in spite of its strong defenses in 1801.

Sound'ing is the process of measuring the depth of the sea. It has been done from the earliest times by a rope, marked off into fathoms, with a leaden weight attached. The difficulty was that there was no certainty that the weight had reached the bottom. In 1854, a new method was tried by which the weight or sinker would be removed from the line when it struck the bottom. Wire rope is usually used for deep-sea soundings. Magellan tried to find the depth of the Pacific ocean in his first voyage around the world, and when he could not find the bottom at 200 fathoms, concluded that he had crossed the deepest part of the ocean. In 1818, Sir John Ross found the depth of the Arctic seas to be 1,050 fathoms, and the Antarctic ocean reached 2,425 fathoms, and twice, with 4,000 fathoms length of line, no bottom was reached. See *Deep-Sea Sounding and Dredging*, by Sigsbee.

Sousa (*sōō'za*), **John Philip,** American orchestra conductor and band leader, was born at Washington, D. C., in 1854, and early in life manifested musical talent and proclivities toward the orchestra in theatres, as well as familiarity with the life of a circus musician. Even at the age of seventeen he was a band conductor and one of the first violin players in an opera troupe. From 1880 to 1892 he was band leader of the United States Marine Corps, and since director of his own, Sousa's well-known band. He has composed many orchestral pieces, marches, songs, waltzes, etc., together with several light operas, such as *El Capitan*, *The Bride Elect* (libretto and music), and *The Charletan*. Among his other compositions, many of which have become very popular, are his *Sheridan's Ride*, *The Liberty Bell*, *The High School Cadets*, etc.

South Af'rican Republic. See TRANSVAAL.

South Amer'ica. See AMERICA.

South Austra'lia. See AUSTRALIA.

South Bend, a town in Indiana on the St. Joseph river, eighty-six miles southeast of Chicago. The Catholic university of Notre Dame, the largest Catholic school in the west, is a short distance north of the town; there are fine buildings, a library and Gothic church with the famous "Chimes of Notre Dame,"

five different courses of study, and 700 students. The great Studebaker wagon and carriage works cover nearly 100 acres, and the Oliver plow works occupy 43 acres, and there are manufactories of agricultural implements, furniture, paper, woolens, and flour. Population 35,999.

South Beth'lehem, a town of Pennsylvania, on the Lehigh river, opposite Bethlehem, the principal Moravian town in America, founded in 1745. South Bethlehem has factories of steel, zinc, boilers, and shovels. It is the site of Lehigh university, founded in 1865 by Judge Packer, who gave it 115 acres of land and $2,500,000. The fine buildings stand on a terrace on South Mountain, and include a fine gymnasium, observatory, several fine laboratories and a beautiful Gothic library building. Population 13,241.

South Caroli'na, one of the southern states of the Union, lies on the Atlantic ocean. It is shaped like a triangle with the coast for a base, and includes 30,570 square miles. The country rises gradually from the low, level lands of the coast to the ridge country on the western border, about 2,000 feet above the sea, with Table mountain and other peaks of the Blue Ridge 4,000 feet high. The coast line stretches for 190 miles, with many islands, which leave a sheltered passage for ships between them and the mainland. The Savannah river, forming part of the western boundary, is navigable for 158 miles, and the Santee for 184 miles. Broad, Catawba, Great Pedee, Astley, and Cooper are other principal rivers. The climate is like that of southern Europe, the sea breezes on the coast and the cool winds from the mountains on the west tempering the heat of summer. The rice lands are malarious and in summer are only habitable by the negroes. The pine forests and sand hills of the western mountain region make fine health resorts. The gold belt of the state extends from North Carolina to the southwest, and there are now four mines, though prior to the war gold had been found in sixty places. There are small quantities of silver, lead, copper, and graphite found, and enormous supplies of iron ore; kaolin, from which the finest varieties of china, and also artificial teeth are made, is found in large quantities, and granite, marble, asbestos, soapstone, mica, whetstone, and especially phosphate rock, are abundant. The cereals, hay, tobacco, and cotton are among the farm products of this agricultural state, with great quantities of fruits shipped to the northern market. Cotton has been cultivated ever since the state was settled, and the Sea Island and Edisto Island cotton are of the first quality, the Edisto cotton bringing twenty times as much a pound as any other variety. Rice has been grown since 1693, and the Carolina rice is now considered the best in the market. South Carolina is the chief cotton manufacturing state in the Union, and makes, besides, flour, lumber, turpentine, and tar.

Since 1870, marked improvement has been made in the school system. The report of the state superintendent of education shows that, in 1895, there were 103,729 white pupils and 119,292 colored pupils enrolled in the schools, making a total enrollment of 223,021. The expenditures during the same year for school purposes was $563,743. Of the institutions for higher learning the most important are, South Carolina college, at Columbia; Furman university, at Greenville; Converse college, at Spartanburg; The Winthrop Normal and Industrial college for women; Presbyterian college for women; Greenville Female college; and the Claflin and Orange universities for the colored people.

A company of Spanish slave hunters in 1520 claimed the country of South Carolina for Spain, but the first settlement was made by Huguenots in 1562 near Beaufort. Charleston was founded by English colonists in 1670, under a grant of the land from Charles II., and in 1729 George II. divided the region into North and South Carolina. During the years before the Revolution, South Carolina was a favorite place for emigrants, especially the French Huguenots. In the Revolutionary war, the state suffered from internal struggles, Marion and Sumter and other leaders keeping up a constant war with the numerous Tory forces. Charleston was captured by Sir Henry Clinton, and there were battles at Camden, Eutaw Springs, etc. The articles of confederation were agreed to first by South Carolina, Feb. 5, 1788. The nullification act was passed in 1833, by which South Carolina declared the United States tariff law "null" and not binding upon the citizens of the state, which act was called treason by President Jackson. South Carolina was the first state to withdraw from the Union and the first gun in the Civil war was fired at Fort Sumter, April 12, 1861. In 1671, 200 slaves were brought into the state from Barbadoes, and since 1820 the colored population has exceeded the white. Population 1,340,316.

South Dakota (*dă-kō'tă*) is one of the northwestern states. Minnesota forms its eastern boundary, Nebraska the southern, North Dakota the northern, and Wyoming and Montana the western. It is 375 miles long, and 220 miles broad, which makes it larger than all of New England. The country is in general a high plain, with the Black Hills in the west, and with many rivers and lakes. The country was once covered by a great lake, the deposits from which, many inches in depth, form a rich soil. Underneath is what is called the Dakota basin, stretching from Nebraska to Manitoba, 500 miles, a great subterranean stream, 800 to 1,600 feet below the surface, which is capable of supplying an indefinite number of artesian wells, many having been already sunk. The

Missouri river, forming a part of the southern boundary, and crossing the state, is navigable the whole distance. The James river, generally called "The Jim," is the longest non-navigable river in the United States. Other large rivers are the Big Sioux, Big Cheyenne, and White. The "Bad Lands" are in the southwestern part of the state, in a region covered with rough grass and sage brush, running to the foot of the Black Hills, a range of mountains extending 100 miles, with its highest peak, Harney, 9,700 feet high. The Sioux reservation is west of the Missouri, 11,000,000 acres of it having been bought by the government and thrown open to settlers in 1890. The climate is modified by the winds from the warm current of the Pacific, so that it is warmer than Minnesota, with its dry air and an average of 300 bright days a year. Dakota is a desirable place of residence. The "blizzards," winter winds laden with fine snow, are very severe, but of rare occurrence. Gold was discovered in the Black Hills in 1870, and in spite of the resistance of the Sioux on whose reservation it was found, the miners rushed into the country. In 1877, the hills were thrown open to settlers. The mines are easily worked, furnishing already over $50,000,000 of gold and silver. Lead, tin, mica, copper, lignite, petroleum, natural gas, granite, jasper, marble, sandstone, limestone, gypsum, and salt springs are among the mineral resources of the state. The principal crops are corn of a very fine quality, wheat, oats, barley, potatoes, flax, and hay from the wild grass of the prairies. The University of South Dakota, opened in 1882, has its fine jasper buildings at Vermilion, where the tuition is free for pupils from the state. The Agriculture college at Brookings, School of Mines at Rapid City, Huron college, Yankton college, and Dakota university near Mitchell, are some of the institutions already established in this young state. Yankton, once the capital of the territory of Dakota, Aberdeen, Deadwood, named by the miners from the dead timber of the hills, Rapid City, Sioux Falls, the largest city in the state, Huron, and Pierre, the capital, are the principal cities.

South Dakota is a part of the Louisiana purchase, made in 1803. Lewis and Clarke's expedition ascended the Missouri in 1804–06, and was followed by fur companies with their pioneer stations. The first steamboats went up the Missouri in 1830, and the first settlement was made in 1857 at Sioux Falls. The territory of Dakota was formed in 1861, which was divided into North and South Dakota in 1889, the President's signature making South Dakota a state being written on Feb. 22, 1890. Its total land area is about 77,000 square miles. Population 401,559.

South O'maha, Neb., a flourishing town, adjacent to Omaha City, in Douglas county, the seat of one of the largest meat-packing establishments in the United States. It is on the Chicago, St. Paul, Minneapolis, and Omaha; the Burlington route; the Fremont, Elkhorn, and Missouri Valley; and the Union Pacific railroads. It has a number of fine, public buildings, including schools, churches, banks; its population has grown in the past decade from 8,062 to 26,001.

South Sea Scheme, called the "South Sea Bubble," was a plan originated by Harley, earl of Oxford, to provide for the extinction of the public debt. A company was formed to which was given the monopoly of the trade of the South seas, and certain import duties, and which agreed to pay the government 6 per cent. yearly on its debt of $50,000,000. The stock rose until it was quoted at 1,000, when some of the principal directors sold out. The bursting of the "bubble" followed, many large stockholders fled, and the excitement was so great that parliament was summoned to decide on the best means of helping in the public distress. Though nothing fraudulent was proved against the directors, their property was confiscated for the benefit of the sufferers, and $35,000,000 due the government was remitted, but this only availed to mitigate very slightly the ruin wrought by the "Bubble."

Southampton (*sŭth-hămp'ton*), an important seaport in England, seventy-nine miles southwest of London. There are remains of the town walls built in the 14th century, and four of the seven gates. The oldest church, St. Michael's, shows the Norman architecture, and God's House, dating from the 12th century, is one of the earliest hospitals in England. There are large docks, a new one covering eighteen acres being built in 1890. There is a large cattle trade with Spain and Portugal, and shipbuilding is extensively carried on. Southampton, called in the Saxon *Chronicle* Suth Hamtune, was founded by the Anglo-Saxons. It was burned by the French, Spanish, and Genoese fleets in 1338. Population 75,325. See *History of Southampton*, by Davies.

South'ern Cross, a group of stars in the southern hemisphere of the heavens, at a considerable distance from the south pole. The four principal stars form a rough cross. It was added to the list of constellations in 1679.

Southey (*sowth'i*), **Robert,** an English poet, was born at Bristol, England, Aug. 12, 1774. He studied at Oxford, where a visit from Coleridge gave him the dream of a community to be founded in America, called the "Pantisocracy," which failed for want of means. Coleridge and Southey married sisters, and after various experiments, reading law, a secretaryship in Ireland, two visits to Lisbon, with intervals in London, Southey settled at Greta Hall in the Lake country, where Coleridge lived, and devoted himself

to writing, for a long time supporting Coleridge's family as well as his own. His works number nearly fifty, filling more than a hundred volumes, and many contributions to periodicals besides. *Madoc*, *Curse of Khehama*, *Thalaba*, and *Roderick* are among his longer poems, though he is best known by a few short ones, such as the *Battle of Blenheim*, and *How the Water Comes Down at Lodore*, and by his *Life of Nelson*, which is one of the best biographies in English literature. He wrote also in prose a *History of Brazil*, and *History of the Peninsular War*. His works brought him a competency and were rewarded by a pension, an honorary degree, and the offer of a baronetcy, and in 1813 he was made poet laureate. He died March 21, 1843. See *Southey*, in the "English Men of Letters" series, by Dowden.

Spadix (*spā'diks*) a peculiar spike-like form of inflorescence characteristic of the Aroids (which see), in which the axis is fleshy. The minute sessile flowers occur only on the lower part of the axis as in Jack-in-the-Pulpit, or completely cover it. See INFLORESCENCE.

Spain, one of the European states, forms with Portugal the southwestern peninsula. It is separated from France by the Pyrenees mountains, and at its most southern point from Africa, by the strait of Gibraltar, and washed on three sides by the waters of the Atlantic and the Mediterranean. The Balearic islands, on its Mediterranean coast, belong to Spain. Portugal is a strip of land 400 miles long, cut out of the southwest corner of Spain. The coast line of Spain, 1,317 miles long, is broken by some fine harbors, as Vigo, Corunna, Cadiz, Malaga, and Barcelona. The Mediterranean shore in the south is rocky, sloping upward to the Sierra Nevada mountains. The country is a high plain, crossed by several ranges of mountains, the highest points being in the Pyrenees and the Sierra Nevada. The rivers, of which there are 230, flow mostly into the Atlantic; the Tagus, Guadalquivir, Duoro, and Ebro being some of the largest. The mines of Spain have been worked from the earliest times. There are mines of lead, copper, tin, iron, salt, and coal. Gold and silver were formerly produced in Galicia, but now silver is found only in Seville, while the quicksilver mines of Almaden are the richest in Europe. The largest industry of the country is farming, which employs from 60 to 70 per cent. of the people. Besides the cereal crops, saffron and dye plants, mulberry trees for the rearing of silkworms, and large quantities of southern fruits, are cultivated. Wine is one of the principal exports. Large herds of cattle, sheep, hogs, asses, and mules are raised, and the horses are descended from the Arabian breeds. The manufactures of the country do not equal those of the middle ages, when Spain was noted for its wool and silk goods, and arms. The principal manufactured products are cork, and cotton, besides silk, linen, leather, glassware, and arms. There is a comprehensive postal system, 8,068 miles of railway, 19,868 miles of telegraph lines, and 6,250 miles of telephone lines. Spain has ten universities — at Madrid, Barcelona, Granada, Valladolid, Saragossa, Seville, Santiago, Salamanca, Oviedo, and Valencia — with about 17,000 students. The school system varies with different provinces, the larger cities and a few of the provinces having schools equal to the best in Europe, but in many others the schools are poor. The public and primary schools are supported mainly by the municipalities, and most of the children are educated free. However, a large proportion of the inhabitants are illiterate. There is on an average one school for every 560 persons.

Spain is governed by a hereditary monarchy, its present constitution being settled in 1870. The cortes, as the governing body is called, consists of two parts — the senate and the chamber of deputies. One-third of the senate hold their seats by inheritance, one-third are appointed by the king, and one-third are elected. In 1890, universal suffrage was introduced. The army in time of peace numbers about 98,000, and the navy 15,725 men, besides 9,000 marines. There are in Spain thirteen military schools and colleges.

The Phœnicians and Greek were the earliest visitors to Spain, where they found a race called by the Greeks Iberians, consisting probably of a number of different tribes. The Carthaginians made the first effort to occupy Spain, founding Carthagena, and were expelled by the Romans, in 206 B. C. The Roman conquest of the peninsula was completed in 19 B.C., when Augustus divided Hispania, as they called it, into three provinces. The country became a thorough Roman province, adopting the Latin language and the Christian religion. After the invasion of the Goths, Spain became a province of the Visigoths, until 573, when she became the seat of the Gothic kingdom, which was destroyed in 711 by the Arab and Moorish invaders. The Moorish kingdom in Spain, lasting three centuries, reached its highest prosperity in 756. Cordova, their capital, was the finest city of western Europe, as may be seen in its grand mosque. Their last stronghold in Spain was Granada, which surrendered to the Spanish army, Jan. 2, 1492.

The different provinces of Christian Spain have been at times independent and then conquered and united. Alfonso I. conquered Galicia, with a part of Leon and Castile, and called himself the king of the Asturias; and Alfonso III., taking possession of the whole of Leon, called it the kingdom of Leon. Navarre was an independent state in the 9th century, and became a powerful kingdom. Castile, at first a republic, was afterward sub-

ject to Leon, then again independent until Ferdinand the Great united it with Leon. Aragon, first a part of Navarre, became an independent kingdom, and then was united with Catalonia. In 1037, the union of Leon, Castile, and Galicia, made Ferdinand the Great the most powerful ruler in Spain. The marriage of Isabella of Castile with Ferdinand of Aragon united those provinces, and the conquest of Granada completed the consolidation of the kingdom; which, with the conquest of Naples, the discovery of America by Columbus, and the possession of large parts of the new continent, raised Spain to a high place among European nations. Philip II. exhausted the strength of the country in his wars with the Netherlands, and in his great preparations for the "invincible armada" and in building the Escurial, the great kingdom he had inherited from his father, Charles V., began to show decline. Spain sided with the emperor in the "Thirty Years war," but received nothing in return, and soon became a subject of contest between the different European powers. Philip V. was the first of the Bourbon kings of Spain, whose accession led to the war of the Spanish Succession, ending in the peace of Utrecht in 1712. From 1808 till 1813, Joseph Bonaparte was king of Spain, though the people did not acknowledge him. Ferdinand VII. was restored to power in 1814, and by the help of the French triumphed over the Liberal party in the kingdom. Florida was sold to the United States, and a large part of the South American colonies were lost during this reign. During the regency of Christina and the reign of Isabella, the Liberal party gained ground until Isabella fled to France in 1868, resigning in favor of her son Alphonso VII. There was a provisional government for two years, a short reign by Amadeus of Savoy, and a republic, ending with the second Carlist war from 1872 to 1876. Don Carlos, who claimed the throne as a brother of Ferdinand, withdrew to France, and Alphonso VII. reigned for eleven years. The present king of Spain, Alphonso XIII., was born in 1886, and the country is governed by his mother, the queen regent. The revolt of Cuba led to the Spanish-American war of 1898, that resulted in the complete destruction of the Spanish fleet, and the loss to Spain of all her colonies, save those in Africa. See SPANISH-AMERICAN WAR. Population 18,089,500. See *Philip II.*, by Prescott; *The Moors in Spain*, by Poole; *Wanderings in Spain*, by Hare; and *Castilian Days*, by John Hay.

Spandau (*spän'dow*), a Prussian town, and strong fortress, is situated on the Spree river, eight miles northwest of Berlin. As it defends the capital on that side, it is very strongly fortified, and in its citadel is kept the reserve fund of $30,000,000, reserved by the government ready for war. There is an arsenal a cannon foundry, and gunpowder factories, and a garrison of 4,000 men. One of the oldest towns in Brandenburg, it surrendered to the Swedes in 1634, to the French in 1806, and to the Prussians in 1813. Population 55,841.

Span'ish-Amer'ican War. The people of the United States had long watched the struggle of the Cubans against the tyranny of Spain, and with deep sympathy and indignation had witnessed the inhuman cruelties with which the war had been waged on the part of Spain. The devotion of the Cubans to their cause, the brutality with which the peaceable inhabitants of the island were treated, and the inability of our government to induce Spain to adopt reforms that would be acceptable to the Cubans, made intervention a duty the United States could not evade. The tension of the situation was increased by the destruction of the United States battleship *Maine* by an explosion, while on a friendly visit in the harbor of Havana, on the 15th of February, 1898. Of her crew, 266 men, including two officers, were killed. A naval court of inquiry after thorough investigation declared it to be their opinion that the *Maine* was destroyed by a submarine mine. The American people, while not asserting that the act was one of treachery on the part of the Spanish government, did believe that without complicity on the part of Spanish officials at Morro castle the vessel would not have been blown up by mines operated by electric batteries located within that fortification.

Matters now drifted rapidly toward war. On April 11, President McKinley sent a message to congress in which he declared that he had exhausted every effort to prevent a resort to arms. On April 19, the two houses of congress passed the following preamble and resolutions: —

"WHEREAS, The abhorrent conditions which have existed for more than three years in the island of Cuba, so near our own borders, have shocked the moral sense of the people of the United States, have been a disgrace to Christian civilization, culminating as they have in the destruction of a United States battleship, with 266 of its officers and crew, while on a friendly visit in the harbor of Havana, and cannot longer be endured, as has been set forth by the President of the United States in his message to congress of April 11, 1898, upon which the action of congress was invited; therefore,

"*Resolved*, 1. That the people of the island of Cuba are, and of right ought to be, free and independent.

"*Resolved*, 2. That it is the duty of the United States to demand, and the government of the United States does hereby demand, that the government of Spain at once relinquish its authority and government in the island of Cuba and withdraw its land and naval forces from Cuba and Cuban waters.

"*Resolved*, 3. That the President of the United States be, and he hereby is, directed and empowered to use the entire land and naval forces of the United States, and to call into actual service of the United States the militia of the several states, to such extent as may be necessary to carry these resolutions into effect.

"*Resolved*, 4. That the United States hereby disclaims any disposition or intention to exercise sovereignty, jurisdiction, or control over said island, except

for the pacification thereof, and asserts its determination, when that is accomplished, to leave the government and control of the island to its people."

On April 21, the American minister at Madrid received passports from the Spanish government and on the same day the Spanish minister left Washington. On April 24, Spain issued a declaration of war with the United States, and on the next day the American congress issued a similar declaration. The President issued a call for 125,000 volunteers, and the equipment of army and navy was vigorously pushed. The first action of importance was the naval battle in Manila bay. At daybreak on May 1, Commodore Dewey, in command of the Asiatic squadron of the United States navy, entered the harbor. His squadron consisted of the cruisers *Olympia* (flagship), *Raleigh*, *Baltimore*, and *Boston*, and gunboats *Concord* and *Petrel*, and the revenue cutter *McCulloch*, with two transports. Here he met the Spanish fleet, consisting of the *Reina Cristina*, *Castilla*, *Don Antonio de Ulloa*, *Isla de Luzon*, *Isla de Cuba*, *Gen. Lezo*, *Marquis de Duero*, *Cano*, *Velasco*, *Isla de Mindanao*, some small gunboats, and a transport. The result of the battle was the entire destruction of all the Spanish vessels and the silencing of the land batteries. Commodore Dewey did not lose a ship, nor a man, while the Spanish lost their entire fleet and from 600 to 700 men.

Spain sent to the defense of Cuba, a fleet under command of Admiral Cervera, which took a secure position in the harbor of Santiago. The city of Santiago was also garrisoned by a Spanish army under General Linares. This city and harbor thus became the objective point of American attack. The American fleet, under Admiral Sampson, being unable to enter the harbor, which was thoroughly protected by fortifications, took position before the entrance, to prevent egress of the Spanish fleet. An American army of 15,000, under Major-general Shafter, landed at Baiquiri, near Santiago, June 23. Advancing, they encountered a Spanish force at Las Guasimas June 24, and a sharp engagement was fought, the enemy being driven back. On July 1, a severe and decisive battle was fought on the heights of San Juan and El Caney, overlooking Santiago, resulting in the defeat of the Spaniards. General Linares was wounded. General Vara del Rey, second in command, was killed, and the command of the Spanish forces, which withdrew within the fortified lines of the city, devolved on Gen. Josi Toral.

On July 3, the Spanish fleet under Admiral Cervera attempted to escape from the harbor of Santiago. As the vessels appeared in line they were pursued by the *Brooklyn*, the *Oregon*, the *Iowa*, and the *Texas* of the American squadron, and the converted yacht *Gloucester*. The Spanish ships *Maria Teresa*, *Almirante Oquendo*, and the *Vizcaya*, were within a few minutes forced ashore and surrendered. The *Cristobal Colon* made a desperate attempt to escape, but was run ashore and sunk about sixty miles from the mouth of the harbor. The two torpedo-boat destroyers, *Furor* and *Pluton*, were wrecked within four miles of the harbor. Admiral Cervera, Captain Eulate, and more than 1,300 officers and men were taken prisoners. The loss of life on the Spanish vessels was large, while on the American fleet only one was killed. None of the American vessels was injured seriously in the engagement.

On July 17, General Toral surrendered to General Shafter his army, and the city and province of Santiago de Cuba, which embraced all eastern Cuba. An American army under General Miles landed on the island of Porto Rico at Guanica, July 25, and advanced toward San Juan, occupying various points, without serious fighting. On Aug. 12, a peace protocol, suspending hostilities and providing for the appointment of commissioners to treat of peace between Spain and the United States, was signed at Washington, the French minister, M. Cambon, acting in behalf of Spain. The American troops, in command of General Merritt, and the fleet under Admiral Dewey, made a combined attack on Manila, August 13, and after six hours fighting the Spaniards surrendered the city, with 7,000 prisoners.

The peace commissioners appointed by Spain and the United States met at Paris, Oct. 1. The United States commissioners were William R. Day of Ohio, Senators William P. Frye of Maine, Cushman K. Davis of Minnesota, George Gray of Delaware, and Mr. Whitelaw Reid of New York. After lengthy deliberations a treaty of peace was signed, Dec. 10, 1898. By this treaty, Spain relinquished all claim of sovereignty over, or title to, the island of Cuba, and ceded to the United States the island of Porto Rico, the island of Guam, and the Philippine islands; the United States agreeing to pay to Spain the sum of $20,000,000. The close of the war, which lasted only 113 days of actual hostilities, left Spain with no colonial possessions in the Western hemisphere. See *History of the Spanish-American War*, by H. Watterson.

Sparks, Ja'red, an American historian, was born at Willington, Conn., May 10, 1789. He studied at Harvard, settled as a Unitarian minister at Baltimore, and finally became editor of the *North American Review*. He was ten years a professor of history at Harvard, and for four years its president. His writings include *Life of John Ledyard*, *Life of Gouverneur Morris*, and *Library of American Biography*, in ten volumes. He edited the *Works of Benjamin Franklin*, and the *Writings of George Washington*. He died at Cambridge, Mass., March 14, 1866. See *Memoir*, by G. E. Ellis.

Spar'row, any one of various small birds belonging to the finch family. They are

plainly colored and usually have their plumage streaked with brown, black, gray, and rusty. About thirty common varieties are found in the United States, and among them are a number of good singers. They are hardy birds, feeding on seeds, and some kinds are to be seen in any month of the year. Some kinds go south at the approach of winter, others are permanent residents, and still others come from the far north, where they nest, to spend the winter in the United States. The song sparrow is one of the commonest and rears three broods a year. The chippy is very common about our yards and houses. The most persistent is an imported bird — the common European house sparrow, or English sparrow, which was introduced into the United States about forty years ago. Although destroying many caterpillars, it drives other birds before it, and has become a nuisance and a pest, but they are too numerous, and multiply too rapidly, to be easily got rid of. Other well-known kinds are the fox sparrow, swamp sparrow, tree sparrow, field sparrow, and the white-throated sparrow.

Spar'row Hawk, a small falcon, abundant in the United States. It is about eleven inches long, with a tawny plumage, marked with bluish and black, a rusty-colored crown, and a chestnut tail. There is considerable variation in its plumage. Notwithstanding its small size, it is one of the most active and courageous of birds. The sparrow hawk is the American representative of the European kestril, which is a larger but similar bird. It feeds upon mice, grasshoppers, and other insects. Its nest is usually in a hollow tree.

Spar'ta, the ancient Lacedæmon, the famous Greek city, was in the southern part of Greece on the Eurotas river, about 20 miles from the Mediterranean. It was shut in by mountains, one, Mt. Taygetus, rising 8,000 feet; and the valley was so easily defended that it was not regularly fortified until 195 B. C. The city had few fine buildings; the Acropolis was a steep hill with a temple to Athena on its summit, and the white marble theatre was one of the largest buildings. The city was formed from several scattered hamlets, and was governed by two kings, whose powers were equal, and who were at first priests, judges, and generals as well as rulers. There were three classes of citizens; the Spartiatai, or governing class, the Perioikoi, who were free but had no voice in matters of state, and the Helots, or slaves, who were bound to the soil, cultivating it for its owners, and were also employed in war. The greatness of Sparta is due to the laws of Lycurgus, which made it a nation of soldiers. There is some doubt resting on the received traditions of Lycurgus, but there was certainly a very ancient legal code, dating back to 825 B. C. The citizens, according to this code, lived only for the state, and children were under the public care. If deformed or weak, they were not allowed to grow up; if healthy, they were taken from the mother when seven years old, and drilled in military exercises, in habits of endurance, and skillfulness, and in speaking short sentences, to the point, which last gave rise to the expression, "laconic," from the name of the province, Laconia. Their training is illustrated in the story of the boy with the stolen fox, who was applauded because he bore the torture of the desperate animal tearing his flesh rather than by crying out and confessing that he had stolen him. Between the ages of twenty and sixty all Spartans served in the army, and though allowed to marry and to engage in business, ate and slept in the public barracks. The early struggles of Sparta with Messenia, Argos, and Athens, gave Sparta the victory and made it the chief power in Greece, but its tyranny induced rebellion, and the Thebans under Epaminondas reduced Sparta to its old boundaries. The Macedonians still further cut off its provinces, and finally, with the remainder of Greece, it became a part of the Roman empire. The modern town of Sparta, founded by the Greeks in 1836, the capital of Laconia, occupies a part of the site of ancient Sparta.

Spartacus (*spär'tă-kus*), a leader in a revolt of Roman slaves, about 73 B. C., was born in Thrace. He was first a shepherd, then the head of a band of robbers, and when taken was sold to a trainer of gladiators at Capua. He escaped with seventy others and fled to the crater of Vesuvius. Here he was joined by many runaway slaves, conquered all forces sent against him, and sacked many of the cities of southern Italy. His army increased to 100,000 men, whom he sought to induce to march across the Alps and to seek their old homes, but the fever of revenge and conquest was upon them, and Spartacus continued his fight with the Roman authorities. At last he was defeated by Crassus in 71 B. C. while trying to seize the shipping at Brundusium and slain at Petelia.

Spar'tanburg, S. C., the capital of Spartanburg county, on the Glen Springs, Port Royal, and Western Carolina, and the Southern railroads. It lies about 92 miles northwest of Columbia, the state capital, and 72 miles southwest of Charlotte, N. C. It is the seat of Wolford Methodist Episcopal college, and has a number of churches, schools, and other public institutions. The industries of the region consist of gold and iron mining and limestone quarrying; brick works, carriage factories, etc., are among the other occupations of the city. The population has in the past decade increased from 5,544 to 11,395.

Spathe (*spāth*), the very highly developed bract which invests the spadix. In Jack-in-the-pulpit it is tubular below, and spreads above into an overarching hood. In the calla lily it is very large, and beautifully

white. The spadix with its spathe is characteristic of the Aroids, and in the numerous tropical forms the spathe is extremely varied in form and often brilliantly colored.

Specif'ic Grav'ity. See DENSITY.

Specif'ic Heat, a term used in the physical sciences and in engineering to denote *the quantity of heat necessary to raise the temperature of one gram of a substance through one degree centigrade at any given temperature.* This quantity of heat is known as the specific heat of that substance at that temperature.

Or if we use the *calorie* as the unit of heat an exactly equivalent definition of specific heat is the following: *The ratio between the amount of heat required to raise the temperature of any body one degree and that required to raise the temperature of an equal mass of water one degree.*

The following is a table of specific heats of some of the more common substances: —

Aluminum	0.214	Tin	0.056
Sulphur	0.203	Iodine	0.054
Iron	0.114	Antimony	0.051
Copper	0.095	Mercury	0.033
Zinc	0.095	Platinum	0.032
Silver	0.057	Lead	0.031

See HEAT.

Spec'tacles are instruments used for aiding the sight. They are said to have been invented in the 13th century. The first ones were very clumsy, and there was very little improvement until the beginning of the 19th century. Spectacles are worn for strengthening the vision, when it is weakened by old age, or to remedy any natural defect, such as nearsightedness, and also to protect the eye from too strong light. The glasses or lenses used should be made of the best of glass and carefully ground, though sometimes they are made from rock crystal and called "pebbles." The glasses should be very carefully selected to accomplish the purpose intended, it being often necessary to fit each eye separately. For short sight or nearsightedness, the lens is concave and the weakest glass that will permit distant objects to be seen should be used. For the weakness of old age, which is farsightedness, and is first noticed by one's holding a book farther off in reading, etc., the lens is convex, and the strongest glass should be used.

Spec'trograph. See SPECTROSCOPY.

Spec'troscope. See SPECTROSCOPY.

Spectroscopy (*spĕk-trŏs'ko-py*) is a science which has for its object the determination and description of the various radiations which bodies emit, reflect, and absorb. It is to be carefully noted that spectroscopy does not end in the observation of phenomena, but includes also the description of these phenomena in a manner which is at once the simplest and most complete.

METHOD OF SPECTROSCOPIC SCIENCE.

The examination of a body by means of the spectroscope includes, in general, four steps. These are

A. *The Production of Radiation.*

B. *The Separation of the different Radiations.*

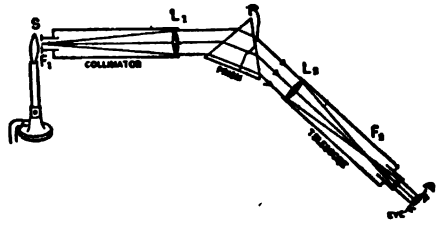
C. *The Recording of the Radiations.*

D. *The Comparison of the Radiations.*

We shall consider the subject from these four points of view.

A. What the spectroscope receives and analyzes is radiant energy. It follows naturally, therefore, that the first step in examining the spectrum of any body is to make that body a source of radiant energy. In many cases this step has already been performed for us. Thus the fixed stars and the gases in which lightning discharges occur are already rendered self-luminous. All we can do, therefore, is to *observe* their spectra; we cannot *experiment* upon them. Bodies at the surface of our earth can generally be made to radiate energy, (1) by heating them, as in the case of a red-hot poker; (2) by passing an electric current through them, as in the case of the Plücker tube; (3) by means of chemical combination, as in the case of the Bunsen flame; or (4) by means of luminescence, of which fluorescence and phosphorescence are examples. As to just how and why these processes cause bodies to emit radiant energy very little is known.

B. Passing now to the second step, namely, the separation of the radiant energy of one wave length from that of the others, this is the peculiar function of the spectroscope, and is usually accomplished in one of two ways, viz., either by interposing in the path of the ray a prism which impresses upon each ray of different wave length a different direction, or by placing in the path of the rays a diffraction grating which accomplishes the same thing. (See PRISM and DIFFRACTION GRATING.) Of these two methods, the first was



A PRISM SPECTROSCOPE ADJUSTED TO VIEW ONE PARTICULAR COLOR IN THE SPECTRUM.

introduced by Newton about the middle of the 17th century, and the second by Fraunhofer near the beginning of the 19th century. The ordinary prism spectroscope, shown in figure 1, is generally made up of three parts, viz., a prism and two astronomical telescopes. One of these telescopes is used to render the rays which fall on the prism parallel to each other, and is therefore called the *collimator.*

The other telescope is made movable so that it can be turned into the proper direction for observing any desired color, and is, therefore, called the *view telescope*. A *grating* spectroscope is essentially of the same construction, see figure 2, except that the dispersion, *i. e.*, the separation of the rays, is produced

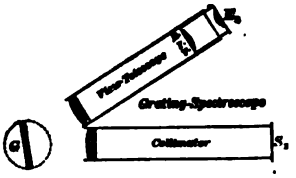


FIG. 2.

by the grating at G, instead of by a prism. The radiant energy is here admitted through the small narrow opening at S_2, called the *slit*.

An image of this slit is produced in the focal plane of the view telescope, and in the ordinary spectroscope is there examined by means of an eyepiece. But if we place a small camera at the end of the view telescope in such a position that the photographic plate will lie in the focal plane of the telescope, we can then obtain a photograph of these images. Such an instrument is called a *spectrograph*.

Among the most powerful spectroscopes known must be mentioned the curved grating instrument devised by Rowland. For the best account of this, see Kayser's *Handbuch der Spectroscopie*. In the same class must be mentioned Michelson's echelon spectroscope, which is well described in Drude's *Lehrbuch der Optik*.

C. Passing now to the manner in which spectra are recorded, this depends partly upon the portion of the spectrum under examination and partly upon the purpose of the examination. If it is merely the appearance of a line a glance of the eye may suffice, provided the line is in the visible part of the spectrum.

But in the ultra-violet part of the spectrum, photography is practically the only available means for obtaining a record. In the infra-red portion of the spectrum, we cannot see and cannot easily photograph what is there; so that here the radiomicrometer or bolometer or radiometer must be used. In general, photography is the best and most easily worked method whenever it is applicable.

D. *Comparison of Spectra.* Let us suppose now that by some means we have analyzed the radiation from a certain body and have recorded its spectrum. The next step in the process is to apply this information to the purpose for which it was obtained. This last step — the interpretation of results — is perhaps the most important one of the four, and the one which demands, in its execution, the largest measure of care and experience. After a spectrum is once obtained it becomes generally necessary to compare it (1) with itself, when the radiation is produced under different conditions; (2) with itself when recorded in another way; (3) with the spectra of other bodies; (4) with some spectrum which has been predicted by theory; or (5) with a standard scale of wave lengths; that is, with an ideal spectrum in which each line differs from its neighbor by one of the units in which wave lengths are measured.

HISTORY OF SPECTROSCOPY.

A bare outline of the steps by which this science has reached the high degree of perfection which it to-day possesses would be something like the following: —

1. Newton, by his careful study of the prism, gave a fairly complete answer to the question of separating the various radiations.

2. Young and Fresnel, by establishing the wave theory of light, along the lines laid down by Huygens, placed spectroscopy upon a sound scientific basis.

3. Fraunhofer, by inventing the diffraction grating, greatly increased the power and simplicity of the instrument.

4. Kirchhoff and Bunsen (1859) showed that each chemical element emits a characteristic radiation and, thereby, established the science of spectrum analysis.

5. Rowland, by the perfection of the plane grating and by the invention of the curved grating, as well as by his superb published spectra of the sun and elements, revolutionized the entire science and gave it a precision hitherto undreamed of.

6. Kayser and Runge, by their study of the spectra of the elements, have shown that there is an order, and not a chaos, running through the thousands of lines already mapped.

7. Michelson (1890–1900) has shown us how a single line in any spectrum may be analyzed and studied in detail; and has thus, at once, multiplied the power and the problems of the science. This he has accomplished by the invention and use of the interferometer and the echelon spectroscope. Kayser's *Handbuch der Spectroscopie* is incomparably the best treatise ever written (1901) on this subject. HENRY CREW.

Spec'trum. If a prism or a diffraction grating be interposed in the path of a beam of white light, it will, provided the beam of white light be small, spread this beam out into a colored band in which the colors are arranged in the following order *red*, *orange*, *yellow*, *green*, *blue*, *violet*. This colored band is called the *spectrum* of white light.

If instead of a pencil of white light, we had passed through the prism a pencil of light from the Bunsen flame, it too would have been separated into its constituent colors, in this case *green*, *blue*, and *violet*, which is the spectrum of the Bunsen flame. If an electric arc had been employed we should have obtained the spectrum of the electric arc, even though a large part of the radiation from the

arc is invisible — has no color — and must be detected by the photographic plate.

So we define the spectrum of any body as the *ensemble* of its radiations, visible and invisible, arranged in the order of their wave lengths. See SPECTROSCOPY.

Speculum (*spek'u-lŭm*) **Metal** is an alloy composed of 126 parts of copper and a little over 58 parts of tin, which is used for the mirrors or "specula" of telescopes. It is very brittle, will take a fine polish, and does not tarnish easily. A silvered glass is, however, taking its place, being just as good and less expensive.

Speke (*spēk*), **John Hanning,** an African explorer, was born May 4, 1827, in Somersetshire, England. At seventeen he entered the Indian army, where between his periods of military service, he collected specimens in natural history and planned available routes of travel. In 1857, he was sent out, with Burton, by the Royal Geographical society to find the great lakes of Central Africa. Speke, when alone, discovered the Victoria Nyanza, and in 1860, with Grant, returned and explored its coasts and followed the river until he was satisfied it was the Nile. It was disputed, however, by Burton and other travelers, and Speke made arrangements for a public discussion with Burton at Bath. But on the morning of the day set, Sept. 15, 1864, he accidentally shot himself. His writings are *Journal of the Discovery of the Source of the Nile*, and *What Led to the Discovery of the Source of the Nile.*

Spen'cer, Herbert, an English philosopher, was born at Derby, England, April 27, 1820.

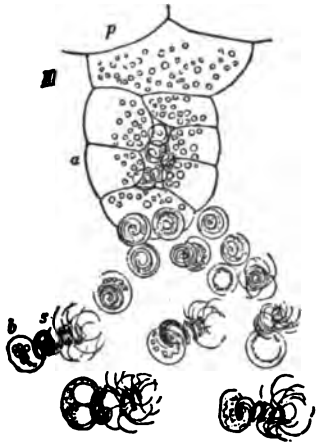
HERBERT SPENCER.

His father was a teacher, and the son received from him a taste for natural science, keeping collections of insects and making drawings of them as a boy. His first work was that of a civil engineer, in which he was engaged for about eight years, publishing during the time several articles in the *Civil Engineers' and Architects' Journal.* From 1848 to 1853, he was an editor of the *Economist.* His first important publication was *Social Statics* in 1850. His great plan was the working out of a system of philosophy which is based on the doctrine of evolution, that is, the theory that the world is the result of a long series of changes, produced by force acting on matter, and resulting in motion. In applying evolution to the study of man in society, Spencer employed assistants to collect and arrange all sorts of facts, in regard to customs, worship, government, etc., of savage tribes, ancient and modern races. His philosophical writings are very numerous, *Principles of Psychology, First Principles, Principles of Biology, Data of Ethics*, and several volumes of essays being among the best known. His brilliant power of drawing conclusions from a vast array of facts, his great knowledge of science, and his wealth of illustration make him popular, as well as give him a high position among philosophers. His most popular works are a small book on *Education*, and *The Study of Sociology*, intended for the ordinary reader.

Spen'ser, Edmund, an early English poet, was born at London, about 1552. He studied at Cambridge, obtaining considerable knowledge of Latin and Greek literature, as is seen in his works, and making a friend of Gabriel Harvey. In 1579, his first work, *The Shepherd's Calendar*, appeared, the first note of the great Elizabethan poetry. It was dedicated to Sir Philip Sidney, one of his stanchest friends, whose acquaintance he had made probably through Harvey. Through Leicester, Sidney's uncle, doubtless, he was appointed secretary to the lord deputy of Ireland, which thus became his home. The country was in rebellion, and Lord Grey suppressed it so cruelly as to be recalled, and Spenser learned the lesson of massacre and extermination, which he afterward advocated, making his name hateful to the Irish nation. His great work, *The Faerie Queene*, was begun in England, but the larger part of it was written in Ireland. The first three books were published in 1590, and brought him great fame, and a small pension, but no political preferment, as he had hoped. Two more cantos and two stanzas were published in 1596, leaving the poem unfinished. The first two books are those usually read, and give the best idea of the beauty of the poem, which places him in the first rank of English poets. Of his other poems, *Colin Clout's Come Home Again*, is perhaps the best known. In 1598, after returning from London to his Irish home at Kilcolman castle, in an insurrection, his home was burned, and he fled with his family to London, which he reached exhausted and destitute, and where he died soon after at a tavern in King street, Jan. 13, 1599. He was buried by Chaucer in Westminster Abbey. See *Spenser and His Poetry*, by Craik, and *Spenser*, by Church, in the "English Men of Letters" series.

Sperm (in plants), the male cell which unites with the egg in the process of fertilization. "Antherozoid" and "spermatozoid" are terms applied to the same body. In all plant groups except the seed-plants, the sperm is chiefly a ciliated, free-swimming cell. In Thallophytes the cilia are variously disposed. In Bryophytes each sperm has a pair of cilia at its anterior end. In Pteridophytes the body of the sperm is large and spirally coiled, tapering into a long slender beak which bears

numerous long cilia. In Spermatophytes ciliated sperms do not occur, except in Cycads



Antheridium of a Fern discharging the Coiled Multiciliate Sperms.

and Ginkgo, the male cells being transferred through pollen tubes.

Spermaceti (*spĕr-mă-cē'tĭ*) is a waxy substance obtained from the oil found in the head of a sperm whale. The oil in the head of an ordinary-sized whale will fill twelve barrels. The oil is drained off and the spermaceti washed with hot water and weak boiling lye. It is a white substance, looking like wax, without taste and with very little odor. It is used for candles and in medicine.

Sper'mary, the male organ of plants, that is the organ which produces the sperms. It is the same as Antheridium (which see), but is substituted for it by those who wish to emphasize the fact that an antheridium holds no relation to the "anther" of flowering plants.

Spermatophytes (*sper'ma-tō-fīts*), the highest of the four great divisions of the plant kingdom, characterized by the production of seeds. The name means "seed plants." This great group has received numerous other names, as "flowering plants," "Anthophytes," "Phanerogams," "Phaenogams," "Phenogams," "Siphonogams," etc. The seed-plants form the most conspicuous vegetation on the earth's surface, and are the plants most usually noticed. They have been evidently derived from Pteridophytes, differing from them chiefly in the production of seeds. The condition which has resulted in the formation of a seed is the presence and retention of a single megaspore ("embryo-sac") in the megasporangium ("ovule"). The two great lines of spermatophytes are gymnosperms and angiosperms. In gymnosperms ("naked seeds") the ovules and seeds are exposed upon the face of the open scale, as in pines, spruces, cypresses, junipers, etc. In angiosperms ("inclosed seeds") the ovules and seeds are inclosed in an enveloping carpel or group of carpels. The gymnosperms are a very ancient race, being represented only by about 400 living species; while the angiosperms are modern, containing more than 100,000 described species. See GYMNOSPERMS, and ANGIOSPERMS.

Spermatozoid (*spĕr'ma-to-zō'id*), (in plants). See SPERM.

Sperm Whale. See WHALE.

Sphagnum (*spăg'nŭm*). A genus of mosses known as the "bog mosses." They are large and pallid forms, which occur in great masses in boggy regions, especially at the north. The sphagnum bogs are great peat formers, and associated with the sphagnums are many strange seed plants, such as carnivorous plants, the rarer orchids, heaths, etc. This association of plants of strange habits seems to be due to the fact that the waters of the bog are poor in nitrogen containing salts, and only those plants which have learned to endure such conditions are found. The genus sphagnum is so peculiar that it forms one of the two great groups of mosses, the other and much larger group being called the "true mosses." Sphagnum is an intermediate form, combining characters which belong to liverworts and true mosses. See MUSCI.

Sphinx (*sfĭnks*), a fabulous creature of Greek mythology. It is represented with the body of a lion, either a human or animal head, and two wings. In Egypt, the head was often that of the reigning king. The great sphinx of Egypt is hewn out of the rock with some of the parts built up by masonry, and was 172½ feet long and 56 feet high. It is situated about a quarter of a mile southeast of the great pyramid. The head is 28½ feet long. There is a small chapel in front of the breast, made of three tablets, and over the door in front are two carved lions. On the pavement was a small lion with an altar between its paws, and a causeway leading to a staircase of thirty steps. Another staircase was built later, and there are also galleries and shafts in the rear. The sand with which nearly the whole of the body—that of a lion crouching close to the ground—is covered, was for a long time thought to have been sifted around it by the desert winds, but it has been shown to have been brought there by workmen. The age of this sphinx is uncertain, but late discoveries prove it to have been at least of the same age as the pyramids. Avenues of sphinxes have been found in Egypt, and several small ones are in European collections. The Grecian sphinx usually had a woman's head, a lion's body, and the tail of a serpent.

Spice Islands. See MOLUCCAS.

Spices, certain vegetable substances, used for flavoring food. They are the product usually of tropical countries, and are brought mainly from the east, though some of them

are found in the tropical regions of America. They come from the different parts of the plant, as ginger from the root, pepper and nutmeg from the fruit, and cinnamon from the bark, and cloves from the bud. Ginger, cultivated in the East and West Indies, is prepared for the market by scalding the roots in boiling water, or by scraping the roots and then washing. The first process makes white ginger, and the last black ginger. Preserved ginger is the young rootstocks preserved in syrup. Nutmeg and mace are obtained from the fruit of trees or shrubs native to Asia, Madagascar, and America. Nutmeg is the kernel or seed of the fruit, which is yellow and looks like a pear that is somewhat round, and has rather hard flesh. Around the nut is a network of fibers called mace, and within the thin brown shell, the nutmeg. The mace is blood-red when fresh, but when dried in the sun turns a light brown. It is sprinkled with sea-water to preserve it and pressed flat. Both mace and nutmegs yield an oil and are used in medicine as well as in food. The trees do not bear fruit until they are eight or nine years old. Cinnamon is the inner bark of the cinnamon tree. The tree is a native of Ceylon, and grows also in China, and South America. The bark is taken from the tree in strips about forty inches long, and gathered into bundles, which makes it ferment so that the outside bark is easily peeled off. It is dried, and rolled up. The best cinnamon comes from Ceylon. Cloves (called so because they look like small nails, from *clavus*, the Latin for nail) is the flower bud of the clove tree. The tree is a native of the Molucca islands, and grows about 40 feet high, and lives to be 100 or 200 years old. The spice is the blossom, and is gathered before it is quite open and dried in the shade. The tree does not grow well except in its native soil. The oil of cloves is used in medicine. Pepper is a berry which grows on a climbing shrub. It is about as large as a pea, and there are twenty or thirty in a cluster. They are yellow when ripe, and black when dried. The black pepper is made by grinding the whole berry, and the white pepper by rubbing off the outer covering before grinding. Cayenne pepper is the pod of a plant, and was first brought from Cayenne in South America. Mustard is obtained from the seeds of a plant, three varieties of which are used — the black mustard found in Europe, the white mustard in Europe, Asia, and the United States, and a weed, called the wild mustard, found in England and the United States. The seeds of the wild mustard are used only to mix with the others. The flour made from the seeds is often adulterated, but mixing it with wheat flour is allowed, as it keeps better, and is less bitter and stinging.

Spi'ders, a distinct group of animals related to scorpions, daddy-long-legs, and mites. United with the latter, they make the class *Arachnida*, which is related to the classes insecta, crustacea, and myriopoda. Their body is separated into two parts, a combined head and thorax, and an abdomen. There are four pairs of walking legs on the thorax which distinguishes them from all insects, the latter having three pairs of legs. The head carries poison-jaws and mouth parts, and, usually, six or eight simple eyes. The arrangement of the eyes is an aid in classifying spiders. They breathe by means of air chambers on the abdomen, which are called lungs. These are two or four in number, and, when the former, there are also air tubes in the body. The spinnerets from which the thread is spun are little knob-like processes on the under side of the abdomen near its tip. There are two, three, or four pairs with numerous horny tubes opening upon them. The substance of the thread is fluid and hardens on contact with the air. It is formed within numerous glands, one of which opens in each horny tube. Fluid issues from the various tubes and is usually united into a single thread. Some spiders, in place of spinning webs, send into the air a slender thread which becomes longer and longer, and, finally, is sufficient to act as a float. They let go their hold and go sailing through the air often for miles, supported by this floating thread. Spiders lay eggs in silken bags, or cocoons, which are sometimes carried about by the female and at other times attached to objects in sheltered places. The kinds of spiders and the webs they form are varied. The common garden spider with its geometrical web is well known. The large black and yellow spider is frequently seen in the fall. The common grass spider makes its web in the form of a funnel in the grass. Some spiders of small size build no webs, but wander about and leap upon their prey like minute tigers. The trap-door spiders inhabit tubular nests in the ground provided with a trap-door to close the entrance. Some triangular spiders, with sharp spines projecting from their bodies, are among the most curious forms. Among the largest spiders of warm and tropical countries is the tarantula, a large, hairy, fierce-looking spider whose bite is poisonous but rarely, if ever, fatal to man. There are also crab spiders (*mygale*), measuring six or seven inches across, which prey upon birds and other small animals. Some of these inhabit our western plains and others are found in tropical regions of the Old World. The king crab is usually regarded as belonging to the same group as the spiders. See McCook's *North American Spiders* (3 vols. 1889–92).

Spike, an inflorescence in which the flowers are sessile, or nearly so, and upon an elongated axis. See INFLORESCENCE.

Spike'let, small spikes which form a part of a larger inflorescence, as in grasses. See INFLORESCENCE.

Spikenard (*spīk'nard*) or **Nard,** a perfume obtained from a small plant, a native of India. It was much prized by the ancients and used in baths and at feasts. The odor is not generally liked by modern nations, and it is now used more in medicine than as a perfume. Some other plants of the same order, used in the place of spikenard, grow on the Alps and other mountains of southern Europe, where the peasants gather them from the rocks.

Spine, a rigid, sharp-pointed outgrowth from plants. Ordinary spines are modified branches and sometimes leaves, which have become stunted on account of deficient food supply. They are most common in plants of arid regions. Sometimes, however, hairs become very rigid and sharp, in which case they are said to be spiny.

Spin'ner, Francis Elias, an American official, was born at Mohawk, N. Y., in 1802. He was in congress from 1855 to 1861, but is best known as treasurer of the United States for fourteen years. In this capacity his signature was placed on all the paper money of the United States, and the very curious autograph, defying imitation, was known all over the world. He retired in 1875, and died Dec. 31, 1890.

Spinola (*spē'nō-lä*), **Ambro'sio,** Marquis of, a great Italian soldier, was born at Genoa, Italy, in 1571. With his brother Frederick he raised a force of 9,000 men whom he kept at his own expense. He served first in the Netherlands. His reduction of Ostend, which had been besieged two years, gave him a great reputation, and he was placed at the head of the Spanish and Italian troops in the Netherlands. His great antagonist was Prince Maurice of Nassau, and in the long struggle between them neither could gain any advantage. After an armistice of twelve years, beginning in 1609 with the renewal of the war, Spinola was once more opposed to Maurice, who died, however, before the walls of Breda. The taking of Breda after a siege of ten months, in May, 1625, was Spinola's last victory. He had spent his fortune in maintaining his troops, but his claims were not acknowledged by the Spanish government, and the vexation of their shameful neglect is said to have hastened his death, which took place in Piedmont, Sept. 25, 1630.

Spinoza (*spe-nō'zä*), **Ben'edict,** the great Dutch philosopher, was born at Amsterdam, Nov. 24, 1632, of Jewish parentage. His philosophical studies gradually drew him away from the Jewish faith, and he was formally excommunicated in 1656, when he changed his name, which was Baruch, to Benedict. In common with all Jewish youth, he had been taught a trade, in his case, that of polishing lenses, by which he now supported himself. At the death of his parents, he contested with his sisters his right to the inheritence, and when he had obtained it, took only one bed. He moved to Leyden, and then to The Hague, where he was offered a professorship at Heidelberg if he would teach nothing opposed to the received religion. He declined the position, also the offer of money by a wealthy friend, as well as a pension, conditioned on dedicating one of his works to Louis XIV., while living on a few cents a day. Separated from his friends, suffering from ill health and want, and harassed by continual persecution, he continued his life of study until his death, at forty-four years of age, Feb. 21, 1677. His philosophical system was based on that of Descartes, and is mainly contained in his *Ethics*, which was not published until after his death. "The world has produced no intellect more profound than that of Spinoza, and Spinoza has produced no book which can be compared with his *Ethics*," which attracted the admiration of such men as Goethe, Fichte, Schelling, and Hegel, and gave character to a school of philosophy. During his life, Spinoza published only two works, *Abridgement of the Meditation of Descartes*, and a *Treatise on Theological Politics*. See *Spinoza and His Environment*, by H. Smith; and *Life*, by Pollock.

Spirogyra (*spi-ro-jī'rä*), a genus of plants belonging to the green algæ, which has received its name from the fact that the very conspicuous chloroplast passes as a broad spiral band from one end of the cell to the other. The species are filamentous forms, and are very common in frothy masses in stagnant fresh water and about springs, being commonly known as "pond scums," or "frog spittle." Spirogyra belongs to the conjugate forms, its filaments becoming connected in pairs by outgrowing tubes at the time of fertilization. See CHLOROPHYCEÆ.

Spitzbergen (*spits-berg'en*), a group of islands in the Arctic ocean, 400 miles north of Norway. They are covered with ice, with sharp projecting peaks, which give them their name, Spitzbergen, meaning "needle-like mountains." On the west coast the climate is affected by the gulf stream, while the eastern coast is icebound and difficult of access. There is a scanty vegetation, with forty species of plants; herds of reindeer, the Arctic fox, and Polar bear are found, with great swarms of seafowl. The longest day is four months, and the long night lasts from Oct. 22 to Feb. 22, in which the moon and stars and occasionally the aurora borealis are the only light. There are no permanent inhabitants, but the islands are visited by Norwegian walrus hunters, and scientific explorers. See *Letters from High Latitudes*, by Lord Dufferin.

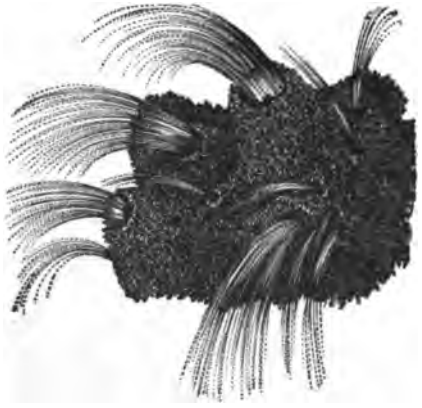
Spof'ford, Ainsworth Rand, ex-librarian of the United States congress, was born at Gilmanton, N. H., Sept. 12, 1825, and educated by private tutors. Early in his career he

settled at Cincinnati, O., as a bookseller and publisher, and became also associate editor of the Cincinnati *Daily Commercial*. In 1861, he became assistant to the librarian of congress, and four years later was appointed librarian-in-chief. In 1897, he was succeeded in this post by J. R. Young, and later by Herbert Putnam. Mr. Spofford has been an industrious compiler of the catalogues of the congressional library, and for some years issued the *American Almanac*. He has also interested himself in copyright matters, and has published a *Manual of Parliamentary Rules*, and edited the *Library of Choice Literature* (10 vols.), the *Library of Historic Characters and Famous Events* (10 vols.), and the *Library of Wit and Humor* (5 vols.).

Spof'ford, Harriet Elizabeth (Prescott), an American author, was born at Calais, Me., April 3, 1835. One of her first contributions to the *Atlantic Monthly*, *In a Cellar*, attracted great attention. She has since published *The Amber Gods; Sir Rohan's Ghost; New England Legends; Azarian, an Episode;* and is still a frequent and popular contributor to the periodicals.

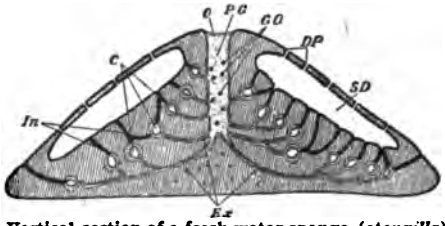
Spokane (*spō'kān'*) **Falls,** a city of Washington, in the eastern part of the state, is on the Spokane river. The water-power at Spokane Falls is owned by a large company, which has built a huge dam and other improvements, making it one of the finest water-powers in the country. Though only settled in 1878, Spokane Falls is a city with electric lights, water works, street cars, telephones, and great hotels. Its chief trade is lumber. Population 36,848.

Sponges, a group of animals intermediate between the protozoa (which see) and animals



SPONGES.

like the hydra and jelly-fishes (cœlentereta). The sponges were formerly regarded as plants, but that was in the days when superficial appearances only were considered. They are distinctly animals, and are usually separated into a distinct subkingdom, called porifera. Although they have no distinct organs, they are clearly a step above the simplest animals. They are many-celled animals and are composed of two distinct layers. The middle layer (mesoderm) is foreshadowed in them, but is not distinctly developed. All



Vertical section of a fresh-water sponge (*spongilla*), showing the arrangement of the canal system. C. ciliated chambers; DP. dermal pores; Ex. excurrent canals; GO. openings of the excurrent canals; PG. paragastric cavity; SD. subdermal cavities; O. osculum.

animals above them have three distinct cell layers. Sponges are mostly marine, but a single genus (*spongilla*) of fresh-water sponges is widely distributed, being abundant in the region about Chicago, as well as in other parts of the United States. These fresh-water sponges are not often noticed by the casual observer. They are clusters of soft, greenish substance looking like algæ. They will, however, shrink when touched, and, if closely watched, a current of water can be seen coming from a crater-like opening in their top. Minute spicules of lime are formed within their substance to serve as a support. They increase by budding and by eggs that are formed in the autumn, and carry the life over to another season. The marine sponges are varied in form, size, and complexity. Their skeletons are either limy, flinty, or horny. The bath sponges and slate sponges represent the horny skeletons only. When they are living, the skeleton is covered with sponge-flesh, and they look on the outside something like a piece of liver, or like a piece of tanned kid, but always with some pores opening into them. They are fished out with a kind of steel fork on the end of a long pole. The flesh is removed, sometimes by imbedding in the sand, and the skeleton is left. The limy sponges and the glass sponges are too hard for commercial use. The sponges are all permeated by branching canals which open by small pores on the surface. These canals lead into larger ones, and, finally, open into chimney-like passages which open outward by an orifice of considerable size. Water carrying oxygen and minute food particles is continually passing in through the small surface pores, traversing the system of canals, and passing out through the crater-like opening. Along the passage way are rounded chambers which are lined by numerous cells provided with flagella. These cells do the feeding. The flagella are hair-like threads of

protoplasm that keep waving and help to produce the currents of water. The simplest sponges are small tubes with many inlets and a single outlet. The more complex sponges have the passage ways very much branched and usually several outlets. Sponges increase by budding and also by the formation of eggs. The sponges of the gulf of Mexico, the Bahama islands, and the West Indies, are of a rather coarse quality. The finest sponges come from the Mediterranean and the Red sea. See Hyatt's *Commercial and Other Sponges* (1883).

Sponta'neous Combus'tion, or burning without the application of fire, sometimes occurs in mineral and other substances. Charcoal, if saturated with oil, may become heated so as to burn, and coals containing iron pyrites, when wet, will catch fire. Phosphorus, when dry, ignites easily, and has been known to melt and burn in a room where the temperature was only 70°, so that in hot weather a fire may be started by large packages of matches. Hay, cotton, tow, flax, rags, straw, leaves, if collected in large quantities, when damp, undergo fermentation, which gives off sometimes enough heat to burn. The cotton rags and waste used in wiping oiled machinery and lamps have probably started many unexplained fires. Spontaneous combustion of the human body has been thought to occur in a number of cases, usually where the individual was an habitual drinker, but is now considered doubtful. Liebig says a dead body filled with alcohol may burn of itself, but not a living one, in which the blood is circulating. See *Letters on Chemistry*, by Liebig.

Sponta'neous Genera'tion of Life, the doctrine that life in some form is developed from non-living matter. The ancients believed that frogs and eels sprang from mud, that insects were generated in dew, that decaying meat bred maggots, that the appearance of other forms of life were to be accounted for by spontaneous generation from lifeless matter. This belief was quite general until the seventeenth century, when the Italian, Francesco Redi, made experiments to test the truth of it. He placed bits of meat in open jars, and others in jars that were covered by fine gauze, and watched for the development of maggots. The blow-flies visited the uncovered meat, but were prevented from reaching the other. Of course, maggots hatched from the eggs, but did not appear in the protected meat, and, by this simple experiment, he proved that maggots did not arise spontaneously from the meat. This was about 1660. He made further experiments and reached the conclusion, not as a matter of opinion, but as a result of experiment, that life arises only from antecedent life, and does not develop spontaneously.

This position was quite generally accepted for larger animals, but with the introduction of the microscope, a new world of extremely minute living beings was made known, and doubts began to be entertained, that those minute beings must always have parents like themselves. It is a well-known fact that fluids, like clear mutton broth, or water in which any vegetable or animal substance has been soaked, will, if allowed to stand, soon become teeming with microscopic life. The possibility of this life arising by spontaneous generation formed a new phase of the question. Needham and Buffon attempted to put the matter to test by boiling infusions, to kill all germs that might exist in them, and corking them tightly. In course of time, these fluids became cloudy and were overrun with microscopic life. But, about 1775, a priest of the period named Spallanzani, showed that their experiments had not been conducted with sufficient care. He boiled infusions for three-quarters of an hour in flasks, and, while the fluid was still boiling, heated the necks of the flasks and, drawing them into a fine point, he closed them by heat. No microscopic life appeared in the flask treated in this way, and the conclusion was drawn that spontaneous generation of life was disproved.

About this time, oxygen was discovered and shown to be necessary to all forms of life. This brought a new point of view, and objection was made to Spallanzani's form of experiments, on the score that oxygen was excluded by sealing the necks of the flasks. In order to test this objection, Schulze and Schwann, in 1836, took up the question again and devised a means of admitting oxygen into the flasks containing fluids that had been boiled. The necks of the flasks were drawn out long, and convoluted, and left open at the ends. In some cases the inlet was heated and air drawn in. In other cases, the air was passed through bulbs containing chemicals that did not alter the oxygen. It was soon discovered that a plug of cotton-wool in the necks of the flasks would act as a filter. It permits the air to pass through and arrests all floating particles and, therefore, does not allow dust or germs to pass through with the air. A flask, or test-tube, is partly filled with an organic infusion; the latter is boiled and, while boiling, a plug of cotton-wool is pushed into the mouth of the vessel. On cooling, the air passes through this plug, but the smallest solid particles are caught in the meshes of the cotton-wool. Organic fluids treated in this way have been known for years to show no sign of microscopic life.

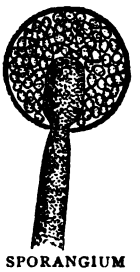
The question was regarded as settled, but, in 1859, it was unexpectedly opened in Paris by Pouchet, who claimed that life was developed in organic fluids even after boiling and preventing the entrance of floating particles from the air. Pasteur, however, demonstrated that Pouchet had been careless, and had admitted solid particles to the flask in the mercury, through which the oxygen had been introduced into the flasks. This closed the question as far

as it could be answered by experiment. Professor John Tyndall added something to the certainty of the matter by an ingenious experiment. He had an air-tight box made with glass windows, through which he passed a strong beam of light in a darkened room. The floating particles in the air, contained within the box, fell of their own weight, and came to rest on the sides and bottom of the box, which had been smeared with a sticky substance to hold them. He could tell when the air was completely cleared of these particles by his beam of strong light, because any minute floating particle would become illuminated, and reflect the light. When they had entirely come to rest, he called the air "optically pure." Through the bottom of this box he had inserted a number of test-tubes with their mouths opening into the chamber, and, by means of a long funnel, and a hole pricked in a rubber membrane at the top, he was able to introduce a variety of organic fluids into these test-tubes. The ends of the test-tubes outside of the box were now inserted into boiling oil and all germs of life that might be contained in the fluids were completely killed. He was able to expose the fluids in these open test-tubes to the optically pure air for months, without any appearance of microscopic life in any of them. To demonstrate that the fluids were capable of supporting such life, he had simply to open for a moment an air-tight door in the back of the chamber and admit some of the outside air. When this was done, the fluids became turbid in a short time, and were teeming with microscopic life. Thus it was demonstrated that microscopic life came from floating germs in the air, and is not spontaneously generated in organic fluids. See Tyndall, *Pop. Sci. Mo.* (vol. 12, 1878); *Floating Matter of the Air*, (1895). WILLIAM A. LOCY.

Spoon'bill, the name of birds related to the Ibises, having long, broadly expanded bills, more like paddles than spoons. They belong chiefly to the Eastern hemisphere, where there are six or seven species. The European spoonbill is a white bird about thirty-two inches long. It breeds in Holland and other parts of Europe. The roseate spoonbill is the only American species. It is abundant in the tropics and also breeds in the southern United States. These birds inhabit marshes, muddy borders of estuaries, and small sea islands over-grown with bushes. They are from twenty-eight to thirty-five inches in length, of a beautiful rose color, deepest on the wings, fading to almost white on the neck, back, and breast. Their tail coverts are deep carmine. They feed at night by gathering insects and shell fishes from the mud in shallow water. In the breeding season they congregate in large numbers.

WHITE SPOONBILL.

Sporangium (*spo-răn'jĭ-ŭm*), an organ of plants which produces asexual spores. In the thallophytes a sporangium is usually a single cell; but in the higher plants it is a many-celled organ. The sporangia of ferns and the pollen sacs of seed-plants are illustrations of many-celled sporangia. In heterosporous plants sporangia become differentiated, the microsporangia producing microspores, and the megasporangia producing megaspores. In seed-plants, the pollen-sacs are microsporangia, and the ovuls are megasporangia.



SPORANGIUM OF A MOULD.

Spore, a plant cell specially set apart for reproduction. Spores have received the greatest variety of names in different groups of plants, but they may all be reduced to two great groups. Asexual spores are those which are formed by the division of a cell, or at least are not formed by the union of cells; while sexual spores are those which are formed by the union of two sexual cells, called gametes. These two types of spores do not differ from one another in power, but in mode of origin. The sexual spore has received the general name oospore; but in plants in which the pairing gametes are similar it is more frequently called a zygospore or zygote. The asexual spores have received very many names. Among the green algæ the characteristic asexual spore is a ciliated, free-swimming cell, and is called a zoospore or swarm-spore. Among fungi, asexual spores have received such names as conidia, ascospores, uredospores, teleutospores, æcidiospores, basidiospores, etc. Among bryophytes and pteridophytes, they are known simply as spores. When heterospory is introduced, they become microspores and megaspores; and in spermatophytes they are known as pollen-grains and embryosacs. Such a multiplicity of names for the same body is very confusing at first, but when the terms are learned they are very convenient in designating either the group or method of origin of the spore referred to.

Sporogonium (*spō-rō-gō'nĭ-ŭm*), (in plants). The leafless sporophyte of mosses, as distinguished from the leafy sporophyte of ferns and seed-plants. When highly organized, it consists of foot, seta, and capsule; and its sole function is the production of spores. See MUSCI.

Sporophore (*spō'ro-fōr*), (in plants), a special branch which bears spores. Used chiefly among the Fungi, where special

spore-bearing branches arise from the mycelium. See FUNGI.

Sporophyte (*spō'ro-fīt*). In alternation of generations (which see) among plants, the generation which bears the asexual spores is the sporophyte, as distinguished from the generation which bears the sex organs and produces the sexual spore, called the gametophyte. In the mosses, the sporophyte is the leafless sporogonium (which see), consisting chiefly of a spore case (capsule) on a stalk. In the ferns and seed-plants, the sporophyte becomes the conspicuous leafy part of the plant, in fact the whole plant of ordinary observation. It is of interest to note that the sporophyte is essentially sexless, and that to speak of "flowers," structures produced by the sporophyte, as having sex organs, is very far from the fact.

Spottsylva'nia Court House, a small village in Virginia, 55 miles northwest of Richmond. It is known as the scene of one of the desperate battles of the Civil war, fought between Lee and Grant, May 10, 1864. When Grant was driven back, with terrible slaughter, he wrote to the secretary of war the famous message, "I propose to fight it out on this line, if it takes all summer." On the 12th the attack was renewed, and the next day Lee, suffering from heavy losses, withdrew to an inner line of intrenchments, from which Grant could not drive him, but moved around him on his way to Richmond.

Spring'bok, a species of antelope found most abundantly in Africa. It is a beautiful creature, larger than the roebuck, brown above and white underneath. The head is white, except a broad band of brown on each side of the eye to the mouth, and a brown spot in the middle of the face. Its name comes from the great leaps it makes, springing into the air from seven to twelve feet. It lives on sandy plains, but great herds will travel to more fertile regions. A traveler describes a vast herd seen by him, pouring through an opening in the hills, a living mass half a mile in breadth and taking hours for the passage. It is growing scarce, though still abundant near the Zambesi river.

Spring'field, the capital of Illinois, is in Sangamon county, a short distance southwest of the center of the state; and, according to the census of 1900, has a population of 34,159. The first settlement was in 1818, and in 1821 the town was made the county seat. In 1837, the capital was removed to this place, and a state house erected. The present capitol building, begun in 1868, first occupied in an unfinished condition in 1876, and completed in 1885, was erected at a cost of $5,000,000.

The surrounding country is a rich agricultural region, the chief products being corn, oats, wheat, hay, fruits, and vegetables. Cattle, hogs, and horses are raised extensively. Bituminous coal is mined in large quantities around the city, and is one of the leading products. During the year ending July 1, 1900, 2,519,511 tons of coal were mined in the county, and four-fifths of this amount shipped by rail to other parts of the country. The principal articles manufactured here are iron, steel, steam engines, boilers, agricultural implements, brick, watches, and woolen goods. It is a railroad center, main lines of the Wabash, Chicago, and Alton; Illinois Central; Baltimore and Ohio Southwestern, and other roads passing through it.

The city has a very efficient public school system. There are fifteen buildings, one for high school purposes with a capacity for 800 pupils, and fourteen other buildings for primary and grammar schools. The school enrollment has reached almost 6,000. Besides, there are several colleges and a number of private schools. Springfield is of historical interest on account of its having been the home of Abraham Lincoln. The house in which he resided, when elected President, still stands; and, in the beautiful Oak Ridge cemetery, just outside the city, is a fine monument erected to his memory, where his remains are deposited. The state fair grounds and buildings, the most extensive in the country, the encampment grounds, and the armory, are located here.

Spring'field, a city in Massachusetts, on the Connecticut river, 25 miles north of Hartford. It is a well-built city, parts of it elevated, with a fine park. It is noted for its fine churches, including a cathedral. The United States armory, employing 3,000 men during the Civil war, and from 500 to 700 ordinarily, and the arsenal, in which 500,000 stand of arms can be stored, are located here. The manufactures of the city are numerous and important, including the Smith and Wesson arms factory, the great car factory at Brightwood, a suburb, and others making gold chains, goldleaf, filters, envelopes, hardware, spectacles, thimbles, etc. Springfield was settled in 1635 by emigrants from Roxbury and called Agawam, from the Indian name of a neighboring river. The city was burnt in 1675, during King Philip's war. Population 62,059.

Spring'field, a city in southwestern Missouri. It is built on a table-land 1,500 feet higher than St. Louis, and has an important trade. There are cotton and woolen factories, flouring mills, and wagon factories. Drury college was founded here in 1873. It was a trading post in 1820, and incorporated in 1830. During the Civil war, it was held by both Federal and Confederate forces in succession, and the battle of Wilson's Creek was fought near the city, Aug. 10, 1861. Population 23,267.

Spring'field, a city in Ohio, in the western part of the state, on the Mad river, eighty miles northeast of Cincinnati. It is in a fine farming

region, and has a large trade in farm products. With good water-power, manufactories are numerous, especially those of bicycles, sewing machines, iron fencing, and farm machinery, including large numbers of mowers and reapers. Wittenburg college, opened in 1845 by the Lutheran church, and Springfield seminary, are institutions of high learning. Population 38,253.

Spur'geon, Charles Haddon, a celebrated English preacher, was born in Essex, England, June 19, 1834. He never received a college education, beginning his great work by making religious addresses. In 1850, while living at Cambridge, he entered the Baptist church, preaching his first sermon in a cottage four miles from Cambridge. When only eighteen he had charge of a Baptist chapel at Waterbeach, and the small congregation was soon doubled. He went to London in 1854, his church there being twice enlarged to accommodate the crowds that flocked to his preaching, until, in 1861, the great "Tabernacle," seating 6,000, was built for him. At one service in the Crystal Palace he preached to an audience of 24,000. His sermons were issued in weekly numbers and translated into many languages. Besides preaching, he conducted a training school for ministers, an orphanage, an almshouse, and built thirty-six chapels in London. His publications reached nearly 100 volumes, including several volumes of sermons. He preached without writing his sermons, which were taken down in shorthand as they were delivered, and carefully revised by himself. The weekly circulation averaged 30,000, but that of particular sermons was much larger. He died at Mentone, France, Jan. 31, 1892. See *Life*, by Spindler, Dyer, etc.

Spy, one employed in war to collect information of the enemy. Spies are always used in regular warfare, and no disgrace attaches to the officers employing them. The dishonor which seems to belong to the person acting as a spy comes probably from the fact that the greater number of spies have been traitors to their country, offering their services freely to the enemy. When a soldier volunteers to penetrate the enemy's lines in disguise, to help his own country and army, it is a brave and honorable act and is so recognized, though the laws of war mete out the same ignominious death to all classes of spies. Major André and Nathan Hale, though hanged, are honored for their devotion and self-sacrifice. The risks of the undertaking have made it attractive to those loving adventure, and many thrilling stories are based upon them, notably Cooper's *Spy*. Political spies are those employed by governments to detect conspiracies. They were used in England in the days of the Tudors, and lately in Ireland. Bismarck was believed to employ them to a large extent, and Napoleon III. had a regularly organized system. Russia has the most perfect arrangements for using spies, both at home and abroad, of any modern nation. See *Secret Service under Pitt*, by Fitzpatrick; *The Two Spies*, by Lessing.

Squid, an elongated cuttlefish extensively used as bait by cod fishers. They are found in nearly all seas and are very abundant on the New England coast. They swim in large schools, following young mackerel and herring, upon which they feed. They are in turn eaten by larger fishes. The common squid ranges in size from six to eighteen inches, or even longer. They swim backward by throwing jets of water through the siphon. They have ten long arms provided with suckers, being in this regard similar to other members of the group (cephalopoda). Giant squids, of a different genus, have been taken, measuring fifty-two feet long, counting the arms. One is reported whose body alone measured twenty-three feet. See CUTTLEFISH.

Squier (*skwir*), **Ephraim George,** an American antiquarian author, was born at Bethlehem, N. Y., June 17, 1821. He was for several years an editor, but becoming interested in the antiquities of the Scioto valley in Ohio, began to make a study of such remains, traveling through the Mississippi valley and the state of New York. He published the results of his work in 1848, in the *Smithsonian Contributions to Knowledge*. While *chargé d'affaires* in Guatemala, he made further explorations there, receiving a gold medal from the French Geographical society for his work. He continued his researches while surveying a railroad route in Honduras in 1853, and while United States commissioner to Peru in 1863. Among his works are *Nicaragua: Its People, Scenery, and Ancient Monuments; Notes on Central America;* and *Peru: Explorations in the Land of the Incas*. He died at Brooklyn, N. Y., April 17, 1888.

Squir'rel, the name for any one of a group of small rodents or gnawing animals. They are found in all parts of the world, except Australia. They are abundant in North America, but are poorly represented in South America and in Europe. There are two natural divisions of the squirrel family, the ground squirrels and the tree squirrels. The latter are graceful, agile animals, with slender bodies and very long bushy tails. They feed mainly on acorns and nuts, but occasionally eat animal food and birds' eggs. They sit upon their haunches and handle nuts adroitly with their fore feet. They cut through the shell with their sharp teeth. The red squirrel, which represents the common squirrel of Europe, is the smallest and prettiest of our tree squirrels. It is about eight inches long, and ranges southward from the northern limit of trees. The gray squirrel is one of the best-known species. It reaches a length of about ten inches, and is common east of the Rocky

mountains from Canada to the Gulf of Mexico. It is subject to great color variations, being sometimes black. This tendency for one species to vary in color is common to all tree

SQUIRREL.

squirrels. Other gray squirrels are found in the western parts of the United States. The fox squirrel is the largest of the species found east of the Great Plains. It reaches a length of twelve inches and has a large tail of about the same length. The tree squirrels have nests provided with food, in hollow trees, in which they pass the severest weather of winter. The ground squirrels make burrows, which they also supply with food.

North America is the richest of all countries in ground squirrels. The group includes such forms as woodchucks, prairie dogs, gophers, and chipmunks. The latter, called also striped squirrels, are the best known. They stand on the dividing line between the burrowing forms and the tree squirrels. They all have cheek-pouches, in which their stores are carried to their nests. The tree squirrels are good eating, and the fur of those inhabiting Siberia and Russia is of commercial value.

Sta'bat Ma'ter ("the mother was standing") is a celebrated Latin hymn on the seven sorrows of the Virgin Mary. It has been set to music by many composers, among them Haydn and Rossini. It dates back to the 13th century, and is thought to have been written by Jacopone, a Franciscan monk. It is used by the Roman Catholic church in its services in passion week.

Stael (*stăl*), **Madame de,** a celebrated Frenchwoman, was born at Paris, April 22, 1766. Her full name was Anne Louise Germaine Necker, as she was the daughter of Necker, the French statesman. She wrote romances in her girlhood, and a volume of *Letters to Rousseau*. She was married in 1786 to the Baron de Stael-Holstein, the Swedish ambassador at Paris, from whom she separated in 1798, though only to save her fortune from his debts, hastening to his bedside when he died. This marriage made her the center of the brilliant society of Paris, for which she was fitted by her wonderful powers of conversation and her strong enthusiasm and passion. She believed in the Revolution, but hated its horrors, making a vain effort to save the life of the queen, and saving Montmorency and other friends from the guillotine at the risk of her own life. She left Paris in 1792, spending four months in London, "four months of happiness saved from the shipwreck of a life," she called them. In 1797, she returned to Paris, where her great influence made Joseph Bonaparte anxious to win her to his brother's cause by offering to secure for her $4,000,000, which was owing to her father from the treasury. She refused the gift, afterward accepting it from Louis XVIII. Napoleon hated her, and finding her "salon" the center of the disaffected party, and himself the butt of the brilliant wit of her circle, he banished her from Paris. She went to Weimar, adding to her intimate circle Schiller, Goethe, and Schlegel. Her book on *The Influence of the Passions* was published in 1796, and the famous one on *Literature Considered in Its Relations to Social Institutions* in 1800, and after her father's death she wrote his life. Her first romance was *Delphine*, her own story, followed by the well-known *Corinne*, written in 1805, after a sojourn in Italy, which made her name known throughout Europe, and revealed Italy to France. Her *Germany* was finished in 1810, and approved of by the censorship, but when 10,000 copies had been printed, the whole edition was seized and destroyed by Napoleon's order on the plea that "it was not French." The manuscript had been saved and the book was published in London in 1813. Her exile now became imprisonment, as she was surrounded with spies, her friends exiled for visiting her, and her walks restricted to a circle of two miles around her home. She escaped to Russia, and finally to London, welcomed in the principal cities, not only because of her genius, but as the enemy of Napoleon. Under Louis XVIII. her old position in Paris was resumed until ended by the return of Napoleon from Elba. In 1811, she had married secretly a French officer, much younger than herself, a marriage acknowledged in her will and made public after her death by her children. She died at Paris, July 14, 1817, leaving unfinished her *Considerations upon the French Revolution*, published by her children, and thought by Sainte-Beuve to be her finest work. See *Life*, by Stevens; *Life and Times*, by Norris.

Stag, the male of the red deer which is found all over Europe and in a large part of Asia. It is a noble animal, about seven feet long, and four feet high at the shoulders, with large, branching antlers. It has been driven from inhabited districts, and is now found only in deep forests. In Scotland, it is

hunted by a form of stalking, but in England on horseback.

Sta'mens, in an ordinary flower, the outer of the two sets of sporophylls or sporangial leaves, the carpels being the inner set. Stamens are microsporophylls, and the spores they produce are microspores (pollen grains). See FLOWER.

Stam'ford, a town of Connecticut, thirty-three miles northeast of New York, on Long Island sound. It is a suburb of New York, and also a summer resort for the business men of the city, whose handsome homes are on all the surrounding hills. There are iron and bronze foundries, manufactories of hats, drugs, sashes, blinds, and locks. The town was settled in 1641. Population 15,997.

Stamp Act, a measure for raising revenue, by requiring the use of government stamps on all legal documents used in the British colonies in America. It was passed in 1765, and was resisted by the colonies because they denied the right of the English parliament to tax them without representation; that is, without their having a voice by their delegates in the matter. Riots took place in many towns and the stamped paper was seized and destroyed. A congress of nine states met and claimed the right of taxation for their own assemblies. The stamp act was repealed by parliament in February, 1766, after a great debate in which Burke made his first speech, and Pitt took the side of the colonists in one of his greatest speeches.

Stamps are issued by governments for use on documents, merchandise, letters, etc. Stamp duties were first imposed in England in 1694. It is a form of indirect taxation, the stamps being bought of the government, and the use of them required by law, and any forgery of them punished. During the Civil war in the United States many articles paid the stamp duty, the last of such taxes being repealed in 1883. Again, in 1898, similar duties were imposed to help meet the cost of the Spanish-American war; but by an act of congress in 1901 most of these taxes were removed. Stamps for the payment of letters were first generally used in England in 1840, at the suggestion of Sir Rowland Hill, and in the United States in 1847. The first English postage stamp was black, with a portrait of the queen, and since then about 1,600 different stamps have been in use in England and her colonies. The first United States stamp, of 1847, had the portrait of Franklin and was worth five cents. There have been a great variety used since, as many as 127 different kinds being in use at one time. Some countries have used the national arms on stamps, and some simply a number with an inscription. Stamp collecting became fashionable about 1864 and has developed into a science called philately, with periodicals and associations devoted to the pursuit. Rare stamps bring large prices, an English one of 1847 with the postal mark will bring about $375.

Stand'ards are weights and measures defined by proper authorities. National standards are defined and preserved by the respective governments of those who use them. There are practically only two groups of standards in use, the *British* and the *Metric*.

The British system is founded upon the standard yard, the standard pound, and the standard gallon. The Metric system is based upon the standard metre, the standard kilogramme, and the standard litre. See POUND, KILOGRAMME, METRE, YARD.

Besides these, the requirements of commerce and of modern science have made necessary standard thermometers, standards of electrical resistance, standards of light, etc. Thus the mercury thermometer, which has been compared directly with the nitrogen gas thermometer at the international bureau of weights and measures at Sèvres, is practically a standard thermometer. The Hefner lamp as tested by the Reichsanstalt at Charlottenburg is practically a standard for sources of light. But these standards, like the ohm, which is the standard of resistance, and the Clark cell, which is the standard of electromotive force, are defined in such a definite manner that they can be copied or made by any one who is equipped to follow the legal prescriptions; and hence they are represented by material or arbitrary standards, as in the case of the metre. See MEASUREMENT.

Stan'dish, Miles, one of the "Mayflower colony," was born in Lancashire, England, about 1584. He served in the army in the Netherlands and sailed with the pilgrims in the *Mayflower* in 1620, though not a member of the Leyden congregation. On reaching Massachusetts he was chosen captain by the pilgrims, and commanded in expeditions against the savages. He settled finally at Duxbury, Mass., where he died Oct. 3, 1656. A monument, 100 feet high, crowned by a statue, has been built to his memory at Duxbury. The story of his unsuccessful effort to secure a wife is told by Longfellow in his *Courtship of Miles Standish.* See *Life*, by Abbot; *Footprints of Miles Standish*, by DeCosta.

Stan'field, W. Clarkson, a landscape painter, was born at Sunderland, England, in 1794. He served in the navy, which he left because of an injury received by falling from the masthead, and began painting theatrical scenes for a living. His first picture that brought him reputation was *Market Boats on the Scheldt*, in 1826. As a painter of marine subjects he stood in the foremost rank, among his best works being *Wreck of a Dutch East Indiaman*, and *Abandoned.* He, with others, founded the Society of British Artists in 1823. He died at Hampstead, May 18, 1867.

Stan'ford, Leland, American public man and philanthropist, was born at Watervliet, N. Y., March 9, 1824, and died at Palo Alto, Cal., June 20, 1893. Early in life he studied law and was admitted to the New York bar; but in 1849, attracted by the gold discoveries in California, he proceeded there and engaged in gold mining and in business in San Francisco. He was one of the organizers of the Central Pacific Railroad company, and entering political life was made Republican governor of California (1861–63). From 1885 to 1893 he was United States senator from California. Out of his large money amassings he gave property to the value of $20,000,000 to found, in memory of a deceased son, a university at Palo Alto, to be known as the Leland Stanford Junior university — a princely and most useful benefaction.

Stan'hope, Lady **Hester Lucy,** was born at London, England, March 12, 1776. For three years she lived with her uncle, William Pitt, as the manager of his household, and his most trusted confidant, and at his death was given a pension by the king. In 1810, she began the life that made her famous, wandering on the eastern shores of the Mediterranean, and settling, in 1814, among the half-savage tribes of Mount Lebanon. She adopted the customs, costume, and religion of the Mohammedans, and obtained great influence over the people, who looked upon her as a prophetess. The old convent, where she lived, was fortified and garrisoned by Albanians and became a refuge for all who needed help. She is said to have sheltered several hundred refugees after the siege of Acre. Her last years were spent in poverty, and she died near Mount Lebanon, with only natives around her, June 23, 1839. See *Memoirs*, published by Dr. Meryon.

Stan'hope, Philip Henry, Earl, an English historian, was born at Kent, England, Jan. 31, 1805. He studied at Oxford and entered the house of commons, where he helped to secure the passing of the copyright act in 1842. His historical works, which rank very high, are *War of the Succession in Spain; History of England from the Peace of Utrecht to the Peace of Versailles*, in seven volumes; and *History of Spain under Charles II.* He also wrote lives of Belisarius, Condé, and Pitt, and edited *Chesterfield's Letters*. He is also known by his courtesy title of Lord Mahon. He died at Bournemouth, Dec. 22, 1875.

Stan'ley, Arthur Penrhyn, dean of Westminster, was born at Alderley, Cheshire, England, Dec. 13, 1815. He was educated at Rugby, under Dr. Arnold, and at Oxford. At Rugby, he was mentioned as the delicate boy in *Tom Brown at Rugby*, who, trembling with fear, still knelt to say his prayers in spite of the jeers and rough usage of his companions. At Oxford, he took the Ireland scholarship, the Newdigate prize for a poem, and a first-class degree; was made a Fellow of University college, and after traveling in the east became a tutor in the college. In 1851, he became canon of Canterbury; in 1856, professor of ecclesiastical history and canon of Christ church, and in 1863, dean of Westminster. As a preacher at Westminster Abbey he had a wide influence, and a great multitude thronged the church whenever it was known that he was to preach. As a leader of the "broad church" party, he invited clergymen of the Scottish church, and of the Nonconformists of England, to address his evening congregations. In 1852–53, he traveled in Egypt and Palestine, gaining material for his work on *Sinai and Palestine* (1856), and in Russia in 1857, embodying the results of the journey in his pictures of the life and history of Russia found in his *Eastern Church*. He was the author of a *Life of Thomas Arnold*, *Memorials of Canterbury*, *Memorials of Westminster Abbey*, and volumes of lectures and addresses. He died at Westminster, July 18, 1881, and was buried by his wife in Henry VII.'s chapel. See *Life*, by Oliver.

Stanley, Sir **Henry Morton,** the African explorer, was born near Denbigh, Wales, about 1840. His name was John Rowlands, and at fourteen he worked his way as a cabin boy to New Orleans, where he obtained employment in the office of a merchant named Stanley, whose name he afterward took. After the death of the merchant, he entered the Confederate army, was taken prisoner, and later served in the United States navy. In 1867, he was a correspondent for the New York *Tribune* in an Indian expedition, and in the same year entered the service of the New York *Herald*. In 1867, he accompanied Lord Napier's expedition to Abyssinia as special correspondent for the *Herald*, and such was his enterprise and skill that the news of the fall of Magdala first reached the British government through the New York *Herald*. While in Spain, still acting as a newspaper correspondent, he was called to Paris, where he received the order from the editor of the *Herald* to "find Livingstone." Traveling by way of Egypt, Palestine, Turkey, Persia, and India, in January, 1871, he reached Zanzibar, and in March set out on his first journey into the heart of the dark continent. Two white men who started with him turned back, but Stanley pressed on with his band of natives, showing the courage and perseverance which have given him so high a place in the long roll of African explorers.

SIR HENRY M. STANLEY.

He found Livingstone, November 10, on Lake Tanganyika, and stayed with him four months, exploring the northern end of the lake and proving that it had no connection with the Nile. He reached England in August, 1872, where he was received with enthusiasm by the whole nation. His book *How I Found Livingstone*, published in the following November, had an enormous sale. As correspondent for the *Herald*, he was in the Ashanti campaign, reaching England again just in time to be present at the funeral of Livingstone, in Westminster abbey.

The death of Livingstone aroused in Stanley a great desire to complete his work. The New York *Herald* and the London *Daily Telegraph* fitted out an expedition, giving him the command, and he left England in August, 1874, for his second African journey. With 350 men he started in November into the interior of Africa. He was ten months in crossing from the eastern to the western coast, arriving at the mouth of the Congo, a white-haired man, the only survivor of his white companions, and with scarcely a third of his native troops. The story of his journey, *Through the Dark Continent* is more exciting than any romance. The direct results of the journey were the determining of the boundaries of lakes Victoria Nyanza and Tanganyika, and the tracing of the Great Congo river from the heart of Africa to the Atlantic ocean, thus changing materially the map of Africa. The opening of the Uganda region to missionaries, the forming of the Congo Free State, and the general scramble for Africa among European nations followed. Stanley acted from 1879 to 1884 under the king of Belgium in organizing the Congo Free State, returning afterward to the United States, where he delivered lectures on his African work. In 1889, he was sent in command of an expedition for the relief of Emin Pasha. He left the mouth of the Congo June 15, divided his forces at Yambuya, 1,300 miles from the sea, was for months hid from the civilized world, but, through disaster and loss of friends and followers, pressed on until he found Emin on the shores of lake Albert Nyanza. On this journey he discovered a great forest in the northern part of the Congo basin, and the huge snow-capped summit of Ruwenzori, 18,000 feet high. Other of his works are *In Darkest Africa* (1890), *My Dark Companions* (1893), *Slavery and the Slave Trade in Africa* (1893); *Congo and its Free State; Coomassie and Magdala;* and *Through South Africa*. In 1899, he was knighted.

Stan'ton, Edwin McMasters, an American statesman, was born at Steubenville, O., Dec. 19, 1814. He graduated at Kenyon college, and practiced law at Steubenville, at Pittsburg, and finally at Washington. In 1860, he was made attorney-general of the United States, and in 1862 secretary of war. This important position he held during the Civil war, and many decisive movements of the army were made at his suggestion. Difficulties with President Johnson led to his resignation in 1868, congress passing a vote of thanks for his ability and faithfulness. He was nominated judge of the supreme court by Grant, but died Dec. 24, 1869, before his commission was made out.

Stan'ton, Eliz'abeth Ca'dy, an American reformer, was born at Johnstown, N. Y., in 1815. Her attention was first drawn to the wrongs of women in her father's law office, where she heard their bitter complaints of the injustice of the laws. When fitted for college, having won the first prize in Greek, she could find no college that would admit a woman, and when attending the world's anti-slavery convention in London in 1840, with her husband, who was a delegate, all the women delegates were refused admission. One of these was Lucretia Mott, with whom she joined in the work of reform, the first woman's rights convention being held at her home in Seneca Falls, N. Y., July, 1848. Ever since she has been one of the most prominent workers in the cause, addressing legislative and political bodies, and her efforts have been successful in many directions.

Star Cham'ber, a court which met in the council chamber of the palace of Westminster. The roof of the room was decorated with gilt stars, which is supposed to have given the court its name. It was founded or restored in 1487 by Henry VII. to assist in bringing to justice the great landowners and nobles. It was independent of a jury, who were too often afraid of the nobility, and could inflict any punishment but death. The trial was conducted by written questions, unless the accused chose to confess. This confession became such an abuse, torture being used to extort it, that in 1641 the court was abolished.

Star of Beth'lehem, a class of plants belonging to the lily family, somewhat like the hyacinth. It is a native of the Eastern hemisphere. The common variety comes from France and Switzerland, and is found everywhere in gardens, with its clusters of white flowers, and narrow, green leaves, growing from bulbs.

Starch, a vegetable substance found in most plants, particularly in the seeds, bulbs, tubers, etc. For commercial purposes, starch is obtained from numerous plants, chief among which are wheat, corn, rice, and potatoes. It has the same elements as sugar, — carbon, hydrogen, and oxygen, — but in different proportions. It is made up of small round grains or granules, which differ in shape in each species of plant. As usually prepared, it is either a white powder, or irregular white columns, which come from the breaking up of a

dried cake of the material. It does not dissolve perfectly in cold water, but with hot water the granules burst, forming a clear paste, which is the starch used in the laundry. When heated to about 320° it is changed into dextrine, which is the gum used on postage stamps. Starch is found especially in the cereals, in potatoes, in carrots and parsnips, in sago, tapioca, and rice. Potatoes are about one-fifth starch; rye, oats, wheat, and corn nearly two-thirds; and rice about nine-tenths. Starch is made from corn, by soaking it for forty-eight hours in water, then grinding it and straining through sieves, after which the starch is allowed to settle in vats, when it is washed, bleached, and dried. Potato starch is made by grating the potatoes, adding water and straining, settling, washing, and drying. Wheat starch and rice starch are made by slightly different processes, in order to remove the gluten which they contain. Arrowroot, tapioca, sago, and cornstarch are forms of starch used as food. Starch is also used in the manufacture of calico, and other cloths, in mounting photographs and in the laundry. It is also used in the manufacture of glucose, (which see). Cornstarch was first made in the United States in 1842. The factories at Oswego, N. Y., and Glen Cove, on Long Island, are the largest starch factories in the world. There are about 100 starch factories in the United States, making corn, wheat, and potato starch, of which 10,000,000 pounds are exported yearly.

Star'fish, the name for a number of marine animals having arms or rays arranged around

STARFISH.

a central disk. As these are symmetrically arranged, the animal is said to have radial symmetry. There are several varieties, but the common five-rayed starfish is the type. It is reddish, or yellow, in color, and those along the New England coast commonly vary from one inch to one foot in diameter. It lives on the sea bottom and crawls sluggishly by means of tube-feet. It is often seen in shallow pools left by the retreating tide. The skin is stiffened with plates and nodules of lime. The mouth is in the center of the disk, on the under side, and the animals feed on decaying fish and other animal matter, as well as on small shelled mollusks. Their means of locomotion is peculiar. There are four rows of tube-feet in furrows along the lower sides of the arms. These tube-feet are filled with water and connected with a system of water tubes running through the body. On the back of every starfish may be seen a little rounded knob, which is porous and leads into the water-vascular system. From this tubercle, a tube leads downward to join a circular canal surrounding the mouth, and from this central canal a tube extends into each arm or ray. These latter canals are connected with the tube-feet and also with internal pockets, one for each tube-foot. The nervous system consists of a ring about the mouth and a nerve running from it into each arm. At the extremity of each arm is found a little red eye-spot which is sensitive to light. Some other starfish have eleven to thirteen rays, and some resemble five-sided pin cushions in form. The brittle starfishes have a central disk, with long, slim, muscular rays by means of which they move. Their tube-feet are not developed. All starfishes possess the power of restoring, or regenerating, lost or injured parts. See ECHINODERMATA, SEA URCHIN. See also Romanes' *Jelly-fish, Starfish,* and *Sea Urchin* (1884).

Stark, John, an American soldier, was born at Londonderry, N. H., Aug. 28, 1728. He served in the French and Indian wars and at Ticonderoga in 1758. At Bunker Hill he was colonel of a regiment which he had enlisted; was at the front in the attack on Trenton, and in the battle of Princeton. He raised a new regiment in 1777, and was given command of the New Hampshire troops sent against the British troops from Canada. On Aug. 16, 1777, he fought the battle of Bennington, receiving for it the thanks of congress and the rank of general. With a new force recruited by him in New Hampshire he cut off Burgoyne's retreat from Saratoga, and after serving in Rhode Island and New Jersey, had charge in 1781 of the northern department, with headquarters at Saratoga. He died May 8, 1822, the last but one of the generals of the Revolutionary army. See *New Hampshire Soldiers in the War*, by Hammond; and *Life of John Stark*, by Edward Everett, in Spark's "American Biography."

Star'ling, a name for a number of common birds found only in the Eastern hemisphere, but lacking in Australia. This is the more remarkable as a starling is found in New Zealand, and others in various southern Pacific islands. The common starling of Europe is the best known. It is a beautiful bird with a dark plumage, having metallic, green, and purple reflections, and each feather tipped

with buff. It nests near houses in bird boxes, when they are provided, and is easily tamed. It can be taught different notes and also to speak words; it is therefore often caged. They kill an immense number of insects and are beneficial to the gardener. A starling inhabiting the steppes and plains of western Asia devours so many locusts that it is called the locust bird. The ox-pecker of Africa is also a starling.

Stars, those heavenly bodies which appear as bright points having fixed positions in the sky. The spectroscope in the hands of Fraunhofer, Huggins, and others, has shown that these so-called "fixed stars" are really gigantic and very distant suns; for they give continuous spectra crossed by dark lines, indicating, as in the case of our central luminary, a solid or liquid core surrounded by incandescent vapor.

Ptolemy and Hipparchos divided the stars which are visible to the naked eye into six different groups, according to their brightness. These groups are called *magnitudes*, and since the invention of the telescope, this classification has been extended, so that now astronomers grade the stars into about 14 or 15 groups. In the first magnitude they place the 14 brightest stars, including Sirius, Vega, Arcturus, etc.; in the second group are 48 stars, including the Pole star and two Pointers; in the third, 152; in the fourth, 313; in the fifth, 854; and in the sixth, 2,010, making a total of 3,391, which is practically all the stars which can be seen without the aid of a glass. The number of stars which can be photographed, or which can be seen with our largest refracting telescopes, runs into the millions. As to the distances of the fixed stars, this is known only in a few cases, and even then very roughly. This quantity is determined by measuring the annual parallax of the star, a quantity which, except in a very few cases, is so minute as not to exceed the errors of measurement. The nearest star, so far as known, is α Centauri, whose parallax is only ¾ of a second of arc, and even this, our nearest neighbor, is at the stupendous distance of four "light years," *i. e.*, at a distance such that light would require four years to traverse it.

The student should bear in mind that, although these stars are said to be "fixed," most of them exhibit, in fact, a small amount of motion, say a second or so in a year. In addition to this motion across the heavens, which is measured in angle and which is called *proper motion*, stars nearly all exhibit a motion toward us or away from us, what is called *motion in the line of sight*. The measurement of this latter motion is one of the recent achievements of the spectroscope, based on Döppler's Principle. See Miss Clerke's *System of the Stars;* Chambers' *The Story of the Stars;* Lockyer's *Meteoric Hypothesis*, and Scheiner's *Astronomical Spectroscopy*. See NEBULA, PARALLAX, TELESCOPE.

Stat'en Island, the chief island in New York harbor, forming Richmond county, N. Y., and the borough of Richmond in the enlarged city now known as Greater New York. It received its name from early Dutch settlers in honor of the states-general (Dutch *Staten*). It has an area of 58½ square miles, and is about thirteen miles in length and eight miles in breadth. It is separated from Long Island by the narrows, and from New Jersey by the Kill von Kull and Staten Island sound, and has steam-ferry communication both with New York city and with New Jersey, while the Staten Island Rapid Transit railroad reaches the towns, villages, and watering places of importance on the island. Close to Clifton is Fort Wadsworth, and on the north shore is Sailor's Snug Harbor, an asylum for aged and infirm mariners. At Stapleton is a United States marine hospital, and between St. George and Tompkinsville is a United States lighthouse station. On the island are the residences of many of the business men of New York city.

States' Rights, a term used in the United States to indicate a doctrine, based upon an understanding of the constitution, which assumes that the different states of the Union are independent, and that the citizens of a state owe allegiance only to the state; that the states are joined together only for certain purposes; and that the acts of the general government must be approved by the separate states, which possess the right also to "nullify" or to pronounce them of no authority, or if necessary to secede from the Union. The first appearance of this idea was in 1798, when the legislatures of Kentucky and Virginia protested on this ground against the alien and sedition laws, which permitted the President of the United States to remove from the states aliens or foreigners whose presence might be considered dangerous, and to punish sedition in the states. In 1811, and again in 1819, the matter recurred in connection with the United States Bank charter, Henry Clay and the state of Maryland claiming that the government had no authority to create a bank. In 1832, South Carolina attempted to carry the principle into action by pronouncing the high tariff "null and void," and not binding on its citizens. The passage of a compromise tariff law settled the trouble for that time. In 1860–61, the southern states carried out the principle by seceding from the Union, and their action was followed by the Civil war.

State Univer'sity of I'owa, located at Iowa City, was founded in 1847. It comprises a college of liberal arts including civil and electrical engineering, and colleges of law, medicine, dentistry, pharmacy, and school of pedagogy. It is open to students of both

sexes, and has an attendance of 1,438, with a faculty of 102.

Statics (*stăt'iks*), a branch of mechanics. In pure mechanics (or dynamics, as it is frequently called), the effects of forces upon bodies are considered. If the effect of forces upon a body is to change the rate of motion of the body, the forces acting are said *not* to be in equilibrium. Forces and effects of this kind are studied under the head of kinetics. In all other cases, forces are said to be in equilibrium and are studied under the head of statics. If one holds a steel spring in his hands and bends it, he recognizes that there are forces acting upon the spring by the fact that the shape of the spring is temporarily changed. These forces do not produce any motion in the spring; they are in equilibrium.

It is this group of forces which is considered under the head of statics. For another illustration allow a locomotive to stand at rest on a steel bridge. The bridge sags slightly as the locomotive takes up its position. But the upward force with which the bridge tends to regain its original shape is exactly equal and opposite to the weight of the locomotive. These stresses produced by the locomotive and the strains which result from them illustrate the kind of problems studied under the title of statics.

Statics may, therefore, be defined as the science of the equilibrium of forces. It is very important in this connection for the student to distinguish carefully between a body which is at rest and one which is in equilibrium. A pendulum bob at the end of its swing is in rest; but it is not in equilibrium for at that very instant it is being set in motion by its weight. The two general conditions of equilibrium for any body are: 1, That the sum of all the forces acting upon the body shall be zero, and, 2, That the sum of all the moments of force acting upon the body shall be zero.

The application of these general principles to the cases of simple machines, such as the lever, inclined plane, etc., is the portion of statics ordinarily studied in physics; while the application of these same principles to various structures, such as bridges, roofs, etc., is the part of statics which is pursued by engineers. The conditions under which fluids remain in equilibrium form the science of hydrostatics.

Stevinns (1548–1603) showed that a force can be completely represented by a straight line. And it is upon this simple fact that a branch of mathematics called graphical statics has been recently founded, and has furnished many elegant geometrical solutions of engineering problems. For an unusually interesting history of statics, see Mach's *Science of Mechanics*. Minchin's *Treatise on Statics* (Clarendon Press) contains an extraordinarily clear presentation of the entire subject.

Steam is the vapor of water. Water gives off vapor without being heated, but this process is usually called evaporation, and the word "steam" is limited to the vapor which arises from boiling water. Steam is lighter than air, and occupies much more space than water; a cubic inch of water will make nearly a cubic foot of steam. Water boils at 212° and makes steam, which has the same temperature as the water, but really contains more heat, so that the steam from a boiling teakettle will burn more severely than the boiling water. This extra heat is called latent heat, because it does not affect the thermometer. The boiling temperature, 212°, is practically constant in vessels which have a free outlet for the steam; but in closed vessels, like boilers, the boiling-point may be raised, and much pressure is produced at the same time. The pressure increases faster than the temperature; for instance, the pressure at the boiling point, 212° is one atmosphere, but it becomes two atmospheres at 249°, four atmospheres at 301°, and twenty atmospheres at 444°. When the engineer opens a valve to let off steam, the rushing noise it makes shows its power. Steam is used to produce motion, as in the locomotive and other machines; in heating houses; and in other operations where heat is required.

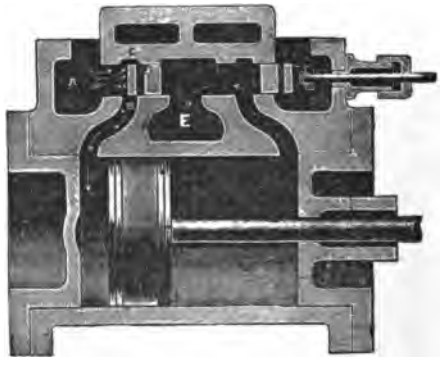
Steam'boat, a vessel moved by steam. A half successful experiment was made by Papin to use steam to propel a boat as early as 1707, but it was not until the perfecting of the steam engine by Watt that any advance was made in steam navigation. Early inventors of steamboats were William Henry, 1783, and John Fitch, 1785–96, in the United States, and William Symmington and Henry Bell in Great Britain, but the first steam vessel to make a voyage of any considerable length was the *Clermont*, made by Robert Fulton in 1807. She was a boat 133 feet long, and made the voyage of 150 miles from New York to Albany in 32 hours. In the same year, Col. John Stevens built at New York the *Phœnix*, which was taken around to the Delaware river by sea because Fulton had a monopoly of steam navigation on the Hudson. This was the first steamboat to make a sea voyage. The first passenger steamboat in operation in Europe was the *Comet* on the Clyde river in 1812, although a successful boat had been on the Clyde canal as early as 1802. The first steamship to cross the ocean was the *Savannah*, a ship of 350 tons, which made the voyage from Savannah, Ga., to Liverpool and thence to St. Petersburg in 1819. Both sails and steam were used. The voyage to Liverpool was made in 25 days. The first vessels to cross the Atlantic using steam the whole distance were the *Great Western* and the *Sirius*, which reached New York on the same day, April 23, 1838. Since then the transatlantic steamship service from New York has

been continuous. All the earlier steamboats were propelled by wheels either at the side or at the ends. The screw propeller was introduced by Smith and Ericson about 1840 (see SCREW PROPELLER), and since then all ocean steamers and many inland steamers use it. Iron and steel have superseded wood for large ships, and steamships have continued to grow in size, in power of engines, and in speed. The voyage from New York to England is now made in a little over five days. The largest and fastest steamers on the ocean to-day are: —

Deutschland, length 686 feet, displacement 23,000 tons, average speed 23.36 knots per hour, H. P. of engines 35,000; *Oceanic*, length 704 feet, displacement 28,000 tons, average speed 20.48 knots per hour, H. P. of engines 28,000; *Wilhelm der Grosse*, length 648 feet, displacement 20,000 tons, average speed 22.79 knots per hour, H. P. of engines 28,000. The average daily coal consumption of the *Deutschland* is 570 tons. Still larger steamships are in process of construction by the Hamburg and the North German Lloyd companies. In the United States, steamship building has until recent years been largely confined to vessels for inland waters. The river steamboats of the United States are fine examples of boat building. They must ascend rivers against strong currents, and often need to travel in shallow waters, and carry large amounts of freight, or tow large fleets of barges. This has developed a large vessel of only a few feet draught and with very powerful engines. On the western rivers most of the boats have stern wheels. The steamers on the Great Lakes rival ocean steamers in speed, size, and equipment. Most of them are engaged in the transportation of grain and of iron ore. Since 1883, ocean steamship building in the United States has developed largely, owing to the impetus given by the construction of the large government cruisers and warships of "the new navy." The largest and finest commercial steamships built in the United States are the *St. Louis* and *St. Paul*, built by Wm. Cramp & Co., at Philadelphia, for the American line.

Steam En'gine, an apparatus for doing mechanical work by means of heat applied to water. The steam engine is a form of heat engine, of which the gas engine and hot-air engine are two other commercial forms. The first steam engine dates back to the second century before Christ, in the toy æolipile of Hero, and in conjuring apparatus used by priests. The beginning of the modern steam engine was in the water-raising engine of Thomas Savery in 1698. In this, the steam acted directly on the water to be raised. The first use of the piston was by Papin in 1705, in a modification of Savery's engine. In the same year, Thomas Newcomen made a piston engine which approached more nearly our modern form. It was as its name implied, an "atmospheric engine." The piston working in a cylinder was connected by a chain with one end of an overhead beam. Steam admitted from the boiler to the cylinder allowed the piston to be raised by a heavy counterpoise hung from the other end of the beam. Then the valve was shut and the steam in the cylinder condensed by a jet of cold water. This left a vacuum in the cylinder and the piston was forced down by the pressure of the atmosphere, and work was done by lifting a pump rod which was fastened to the other end of the beam. The common story is that a lazy but ingenious boy named Humphrey Potter, who had been set to turn the valve, made the engine close and open its own valves by means of cords and thus invented the first automatic valve gear. Newcomen's engines were used solely for pumping water from the English collieries. The modern steam engine is due to James Watt, an instrument maker for the University of Glasgow. Watt's great advances were, (1) in condensing the steam in a separate vessel called the condenser, thus keeping the cylinder hot, (2) in adding an air pump to help maintain the vacuum of the cylinder and remove the condensed steam, (3) in jacketing the cylinder so as to prevent cooling off by conduction and radiation, (4) in making the engine double acting, that is, in forcing the piston back not by the atmosphere but by steam admitted at the other end of the cylinder, (5) in using the steam expansively, in other words, in stopping the admission of steam when the piston had made only a part of its stroke, and allowing the rest of the stroke to be performed by the expansion of the steam already in the cylinder. He also made many inventions of important details, such as the throttle valve, for regulating the admission of steam, the centrifugal governor (see article GOVERNOR), the indicator for studying the actions in the cylinder (see article INDI-

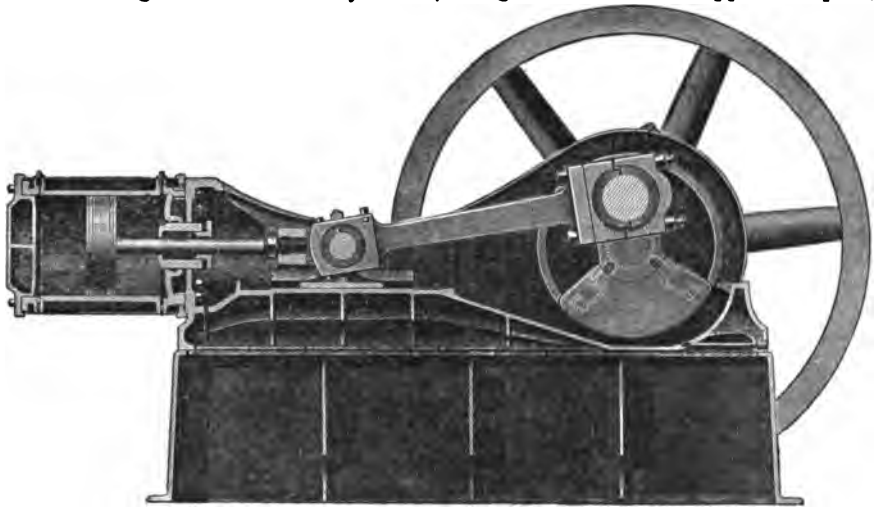
PISTON AND CYLINDER.



PISTON CYLINDER AND SLIDE VALVE.

CATOR), and, in conjunction with Murdoch, the slide valve for controlling the admission and release of steam. He also patented the use of two or more successive cylinders on one engine, or the modern compound engine plan, which is now used in all large engines where economy of fuel is important. Watt's inventive career extended over more than a half century, and he is rightly called the father of the modern steam engine. For the full history of the steam engine, see Thurston's *Growth of the Steam Engine.*

The action of a simple steam engine with the slide valve, one of the simplest forms, can be easily studied from the diagram. This is a horizontal section of a cylinder, showing the piston in the cylinder and the valve below. As shown, the piston has reached the extreme left of the cylinder, and the port B on the right is connected with the exhaust E. This exhaust connects with the atmosphere in non-condensing engines, or with the cold condenser in condensing engines. Live steam is at the same time entering the left end of the cylinder at B from the steam chest A, thus moving the piston back to the right. The time of the admission and cut-off of the steam, and the connection with the exhaust is fixed by the mechanism which moves the valve. The number of valve mechanisms in use is very great, but they all serve the general purpose seen above. Among the best known valve-mechanisms is that due to George H. Corliss. In the Corliss valve-mechanism, there are two separate ports at each end of the cylinder, one for the steam chest and one for the exhaust. This or a modified form is often used on large engines. To convert the straight-line backward and forward motion of the piston into rotary motion, a connecting rod and crank on a fly wheel are used. The efficiency of a steam engine depends largely upon allowing the steam to expand as far as possible, so that its temperature and pressure are as low as possible when it leaves the cylinder. Steam is consequently not used at full pressure through the whole stroke, but connection with the steam chest is cut off at a proper fraction of the stroke and the piston is then moved by the expansion of the steam. Steam engines are rated in horse power, one H. P. representing the work of 33,000 foot-pounds per minute. (See DYNAMOMETER.) The performance of a steam engine is indicated by the pounds of steam or water it consumes per H. P. per hour. For non-condensing engines, 35 lbs. of steam at 100 lbs. pressure is a common performance. The best large condensing engines give records of from 17 to 20 lbs. of steam at 100 lbs. pressure for one H. P. for one hour. The following are terms used to designate different forms of engines. "Horizontal," "inclined," and "vertical" refer to the position of the cylinder. "High" and "low," as applied to speed, are relative terms. A speed of 150 revolutions per minute is a medium speed. Much above or below this is called "high" or "low." "Non-condensing" and "condensing" are terms referring to the exhaust. In a non-condensing engine the exhaust is directly into the air, in a condensing engine the exhaust steam is condensed usually by contact with cool running water. Simple and compound are terms referring to the number of expansions used in the engine. In a simple engine, there is a single cylinder and a single expansion; in the compound engine there are at least two cylinders and two expansions. Compound engines are more economical. Rotary engine is a form of engine in which the piston rotates. In the common steam en-



SECTION OF STEAM ENGINE.

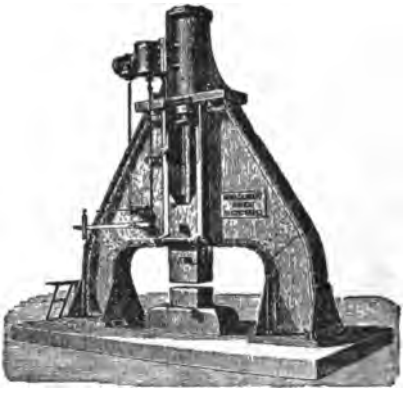
gine the piston moves backward and forward. A rotary engine has the very decided mechanical advantage of compactness and of direct application of power without crank and flywheel, but no rotary engine of the many that have been invented has ever shown itself economical or durable, if we except the steam turbine. See STEAM TURBINE.

A LOCOMOTIVE is a steam engine arranged with wheels so as to drive itself on an iron or steel track. As a steam engine the locomotive has a number of special features. It carries its furnace and boiler with it, and must also be supplied with an auxiliary car or "tender" for carrying water and fuel. The engine is double, that is, there is a high pressure cylinder with piston on each side of the locomotive. Many modern locomotives are also compound steam engines, that is, the steam expansion takes place in two cylinders, a high-pressure and a low-pressure cylinder.

The steam pressures commonly used are from 150 to 200 pounds per square inch. The oscillating straight-line motion of the piston is converted into the rotary motion of the driving wheels by the usual mechanism of a crosshead and crank. The engine must be reversible. This is accomplished by a link-motion due to Stephenson, by which the connection of the valve mechanism with the driving parts can be shifted through an angle. A requirement of the locomotive is the development of a large power in a limited space and with a limited weight. This means the burning of a large amount of fuel per square foot of grate area, and requires forced draft. It is accomplished by exhausting steam directly into the smoke stack. The American and European locomotives differ little as steam engines, but present quite different external appearances. The large cab for the engineer, the pilot or "cow-catcher," the headlight, the prominent whistle and bell, are striking external features of the American locomotive. The frame of the engine and boiler is also quite different, that of the European locomotives being more rigid than can be used on American railroad tracks. The first successful locomotive is due to George Stephenson, and was used to haul coal for the Killingworth colliery in 1815. At the opening of the Stockton and Darlington railroad, a line of 37 miles opened in 1825, a Stephenson engine, weighing eight tons and capable of a speed of 16 miles per hour, was used. Of the early locomotives, R. Stephenson's *Rocket* was one of the most famous. At a competitive trial of locomotives, in 1829, this engine showed a speed of from 25 to 30 miles per hour. These early locomotives are pygmies compared with the heavy high-speed machines of to-day. Speeds of 100 miles per hour have been frequently exceeded in the last few years by express locomotives. The largest locomotive in the world is one in use on the Illinois Central railroad for hauling freight trains over some steep grades on its line. It was built by the Brook's Locomotive works, and weighs, without tender, over 230,000 pounds. The largest locomotive works in the world are the Baldwin works at Philadelphia, Pa.

A. P. CARMAN.

Steam Ham'mer, a hammer which is raised by the direct action of steam on a piston in a steam cylinder. It is used in forging iron, particularly for large and heavy work. The first idea of the steam hammer is due to James Watt, but the first practical scheme of a steam hammer is due to James Nasmyth. His first machine was made in 1843. The piston moved by steam raises the hammer head or "tup," until the steam is cut off and allowed to escape, when the piston with the tup falls, striking the object placed on the hammer. The blows may be regulated so gently as just to crack an egg, or to strike with a force of tons. In modern steam hammers, the force of the blow is increased by the pressure of the steam above the piston, and by automatic valve mechanisms the blows can be repeated with great rapidity. The largest steam hammer ever built is that built for the Bethlehem Iron works in 1891. The piston with tup weighs 125 tons, the cylinder



STEAM HAMMER.

has a diameter of 76 inches, and the length of the stroke is 16½ feet. Such large hammers are no longer used, as the work is done better and cheaper by large hydraulic presses. The

Bethlehem steam hammer has been superseded by a 14,000 ton hydraulic press.

Steam Tur'bine, a form of steam engine in which the rotation is produced by the impact of a jet of escaping steam on the blades of a wheel. There are two forms of the steam turbine in use, the Parsons and the DeLaval. In the Parsons steam turbine the steam from the boiler strikes the blades of a series of turbines fixed on one shaft, and finally escapes into a condenser or into the atmosphere at a low pressure. In the DeLaval steam turbine, the jet of high-pressure steam strikes a series of steel buckets on a wheel similar to a Pelton water wheel. The speed of steam turbines is very high, that of a 150 H. P. Parsons turbine is 4,800 revolutions per minute, while that of a 50 H. P. DeLaval machine has the enormous speed of 15,000 revolutions per minute. These very high speeds require special reducing gearing before use for most machinery. The Parsons turbine has been used successfully directly on dynamos, and also on the shafts of the propeller of an experimental steamer, the *Turbina*. This boat is the fastest boat in the world, having made 34½ knots per hour. It is 100 feet long and has three turbines of a total H. P. of 2,000. Tests of turbines have shown a remarkable low consumption of steam per H. P., that of small steam turbines rivaling that of the best large compound steam engines. For steamships, a great advantage claimed, in addition to economy, is that of the small size and weight of the turbines. Mechanically, the turbine has the great advantage over the piston steam engine that no mechanism is needed to change a backward and forward straight-line motion into rotary motion. Much is being done to develop the steam turbine, but it has not yet come largely into use for general commercial work.

Sted'man, Edmund Clarence, an American poet, was born at Hartford, Conn., Oct. 8, 1833. He studied at Yale, and began his literary career as a journalist, acting as correspondent for the *New York World* during the Civil war. He also contributed to magazines. His first volume of poetry, published in 1860, was rapidly succeeded by others. *Victorian Poets*, which has gone through several editions, appeared in 1875, and *Poets of America* in 1885. He has edited, with Ellen M. Hutchinson, *The Library of American Literature*, in eleven volumes, and has also brought out a Household edition of his poems.

Steel, a term applied to carbonized iron which has a high tensile strength and is elastic. As used formerly, it designated a form of carbonized iron which would harden on being heated to a certain temperature and suddenly cooled, but this definition no longer holds good, for the carbonized iron produced by modern methods and used extensively in structural work now goes by the name of steel. Iron is used in the industrial arts in the three forms of cast iron, wrought iron, and steel, and each form has its own marked physical properties, fitting it for special purposes.

Cast iron is produced by heating iron ores to a high temperature in a blast furnace in connection with various fluxes, particularly limestone. The molten metal contains considerable carbon in a dissolved state and usually silicon, phosphorus, and sulphur. The amount of carbon in cast iron varies from 1.5% to 4.5%. Cast iron can be melted and cast in moulds. It is only slightly malleable (except by special treatment), is rigid and has great resistance to crushing, but is more or less brittle and not adapted to tensile forces. Wrought iron is nearly pure iron, and in modern metallurgical processes is usually got by removing the carbon and other impurities from cast iron. The common method of making wrought iron is that of "puddling," which consists of melting cast iron in the chamber of a flame furnace (see FURNACE) and in removing the carbon, phosphorus, etc., by stirring the molten metal and sometimes adding oxidizing materials. Wrought iron is very malleable, can be welded, has a high tensile strength, shows a fibrous structure rather than a crystalline structure at a break. Steel has been made since very early times by a process called "cementation." This consists of taking a high grade of wrought iron, rolled into bars, putting these in fire-clay boxes with finely divided charcoal, and heating them from three to six days. This recarbonizes the iron, and produces cement or blister steel. Bars of blister steel may be welded together (then called shear steel), or they may be melted in crucibles and cast, then called crucible steel. High-grade tool and spring steel is made by this process, while the cheaper open-hearth and Bessemer processes are used in the manufacture of the great quantities of steel used in engineering construction work. The Bessemer process was invented by Sir Henry Bessemer in 1858, and is regarded as one of the most important of modern industrial achievements. It has made steel manufacture cheap, and it is doubtful if modern methods of transportation by rail and steamships and much of modern machinery would be possible without the cheap Bessemer steel. The Bessemer process consists of burning out the carbon and silicon of crude pig iron by blowing finely divided air currents through the molten metal. The process is conducted in a pear-shaped vessel, called a converter. The Bessemer converter has been little changed from the original form of its inventor. A common size is eight feet in diameter and 15 feet high, and is made of boiler plate, lined with refractory material, ganister for the "acid process," and a mixture of pitch and lime for

the "basic process." The difference in processes to be used depends on the impurities present in the particular pig iron. When the carbon and silicon are burnt out, a proper amount of carbon is added and the steel is poured out and cast. In the open-hearth process, the steel is made by melting together proper quantities of cast, wrought, and scrap iron on the hearth of a flame or reverbatory furnace. The steel from the open-hearth process is commonly more reliable and uniform than that by the Bessemer process, but the latter is the cheaper, and is the steel for most engineering work. Steel is highly elastic, has the greatest tensile strength of any of the metals, and the steels with the higher percentage of carbon, can be hardened and tempered for tools. The term steel is thus used to include a wide variety of carbonized iron made by very different processes and each grade has its special properties. No general law connecting properties with composition has been discovered, and indeed the form the carbon takes in steel is yet undetermined. The uses of steel have greatly increased within a few years, as it has superseded wood, stone, and brick in so many ways, as in bridges and large buildings, and for ships it is now used almost exclusively. The production of iron and steel in Germany, Great Britain, and the United States in 1899 was as follows:—

	PIG IRON.	STEEL.
Germany	8,029,305 tons	6,290,434 tons
Great Britain	9,454,204 "	4,933,010 "
United States	13,838,634 "	10,736,806 "

Steel-building-construction, a method of constructing tall city buildings by building a framework of steel to carry floors and floor loads, and walling this framework in with a wall of light brick or stone work. These buildings differ from the older buildings in that the masonry walls do not carry the loads of the building. They are really an application of the method of the steel-bridge to architecture. The tall office buildings of Chicago, New York, and other American cities are the best examples of this new architectural method. Among the tallest of these buildings are the Masonic Temple, Chicago, 20 stories, 274 feet high, and the Ivin's Syndicate building, New York, 30 stories, 350 feet high to roof.

Steele, Sir **Richard,** a British author, was born at Dublin, Ireland, in March, 1672. He studied at Oxford, but in 1694 suddenly enlisted in a troop of horse guards. His pamphlet known as *The Christian Hero* was published in 1701, followed by very different work in the shape of three plays, *Grief à la Mode*, *The Lying Lover*, and *The Tender Husband*. In 1706, he received a court appointment under Queen Anne, and also the post of gazetteer, with a salary of $1,500, which, with two wealthy marriages, one in 1705 and the other in 1707, gave him ample means. His dissipation, however, kept him in pecuniary trouble most of the time, his life being spent, as he says, "in sinning and repenting." On April 12, 1709, appeared the first number of the famous *Tatler*, a tri-weekly paper which was followed in March, 1710, by the more famous *Spectator*, in turn succeeded in March, 1713, by the *Guardian*. Addison, who was a friend and old schoolmate of Steele, was his valued and valuable assistant in all these enterprises; as he said, "I fared like a distressed prince who calls in a powerful neighbor to his aid; I was undone by my auxiliary; when I had once called him in, I could not subsist without dependence on him." The characters of Sir Roger de Coverley and Will Honeycomb are said to have been first suggested by him, and his fame rests mainly on the essays contributed to these papers. His political career in parliament ended in impeachment and expulsion, for what were considered treasonable writings in *The Crisis*, a pamphlet published by him in 1717, and answered by Swift. He again entered parliament after the death of Queen Anne, was knighted by George I., and in 1722 published his best comedy, *The Conscious Lovers*. He died Sept. 1, 1729. See *Memoir*, by Austin Dobson, in the "English Worthies" series; and *Life*, by Aitken.

Steel'ton, Pa., a borough of Dauphin county, on the Susquehanna river and the Pennsylvania canal, three miles southeast of Harrisburg, with which it is connected by electric railway. Here is the large plant of the Pennsylvania Steel company, engaged in the manufacture of Bessemer steel, for rail, bridge, and construction works. It has, besides, several saw, planing, and flour mills. It is served by the Pennsylvania, and by the Philadelphia and Reading railroads. It has a number of churches, schools, banks, and other public buildings. Population 12,086.

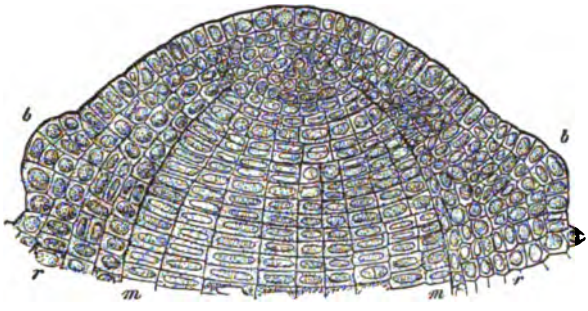
Stein (*stīn*), **Heinrich Friedrich Karl, Baron von,** a Prussian statesman, was born at Nassau, Germany, Oct. 26, 1757. He entered the service of Prussia in 1780, and in four years was head of the mines in Westphalia. He was called in 1804 to be head of the department that controlled customs, taxes, and trade, but being unable to work with the king he resigned in 1807, while in retirement writing an essay on political reform. Before the year was ended, however, Frederick William III. had to recall him, and in less than a year Stein carried out the measures he had planned, which laid the foundation of Prussia's greatness. He abolished the remains of serfdom, did away with privileged classes and all monopolies, and supported the army reforms. But Napoleon, who had advised his recall, now fearing him, insisted upon his dismissal, and in 1808 he withdrew to Austria, and finally to Russia, after having issued his *Political Testament*. He was influential in forming the union against Napoleon. After his return to Prussia, he established a so-

ciety for publishing the historical documents of Germany. He died in Westphalia, June 29, 1831. See *Life and Times of Stein*, by Seeley.

Stele (*stēl*) (in plants). The mature stems and roots of higher plants have three great regions. The outermost is the epidermis; next within is the cortex; while the central or axial region is the stele. The stele is derived from the plerome (which see), and is characterized by developing the vascular bundles. To it also belongs the pith of dicotyledonous stems. In the trunk of an ordinary tree the epidermis has disappeared; the cortex is mostly represented by the corky part of the bark; while the whole mass of wood and the inner fibrous bark belong to the stele.

Stelvio (*stĕl'vē-ō*), **Pass of,** is the highest carriage road across the Alps, remarkable for its beautiful scenery. It is 9,042 feet above the sea, 33 miles long, and forms part of the great road between Milan and Innsbruck.

Stem. In general, the axis part of a differentiated shoot, and in this sense it includes



Vertical section of stem tip, showing growing point (*s*), forming leaves (*b*), cortex (*r*), and central cylinder (*m*), in which the woody bundles are to appear.

the shoot axis of mosses and leafy liverworts. Its special application, however, is among fern-plants and seed-plants, in which group the vascular system is developed. In structure there are several distinct types of stems, but they are all developed in the same general way: At the growing tip of the stem there is a single cell (most Pteridophytes) or a group of cells (some Pteridophytes and all Spermatophytes) known as the apical cell or cells. These apical cells are meristimatic, and by their division organize the two or three great regions of the stem. In the stem of an ordinary seed plant the three embryonic regions, beginning at the outside, are the dermatogen, periblem, and plerome (see all three). The dermatogen gives rise to the epidermis, the periblem to the cortex, and the plerome to the stele. The chief differences among stems consist in the various organizations of the vascular or woody tissues in the stele. For example, in the Gymnosperms and Dicotyledons, the woody bundles are organized into a hollow cylinder, within which is a definite pith; while in the Monocotyledons the woody bundles are scattered in the stele. The usual function of stems is to display foliage leaves, but sometimes they become much modified, especially when they are subterranean. In this case they are usually used for the storage of reserve food, and become variously thickened and distorted, being called tubers, rootstocks (rhizomes), etc.

Stephen (*stē'ven*), king of England, was born at Blois in 1105. He was the grandson of William the Conqueror and nephew of Henry I., king of England. On the death of Henry I., Stephen claimed the throne, though he had taken the oath of allegiance to his cousin Matilda, on whom Henry I. had settled the succession. He was crowned Dec. 26, 1135, but never received the confidence of his people. The kingdom was badly governed, the nobles and clergy were against him, and he had to struggle with Matilda for the throne. In 1141, Stephen was taken prisoner and Matilda acknowledged queen. He was exchanged for Robert of Gloucester, the queen's brother. The queen left England and Stephen reigned quietly until 1152. Henry, the son of Matilda, then contested the throne and the long struggle ended in Stephen making Henry his heir. King Stephen died at Dover, October, 25, 1154.

Stephens (*stē'venz*), **Alexander H.,** an American statesman, was born in Georgia in 1812. He was a member of congress from 1843 to 1856. He was opposed to secession, and made a speech against it before the legislature of Georgia in November, 1860, and when a delegate to the secession convention held at Milledgeville, in January, 1861, voted against the ordinance of secession. He was, however, elected vice-president of the Confederacy, and was one of the prominent statesmen of the seceding states. He was imprisoned at Fort Warren in Boston harbor for five months at the close of the war. He was in congress from 1874 to 1882, when he was elected governor of Georgia. He died at Atlanta, Ga., March 4, 1883. He published in 1867–70 *War between the States*. See *Life*, by Cleveland.

Ste'phens, James, an Irish Fenian, was born at Kilkenny, Ireland, in 1824. He became an active member of the Young Ireland party, was slightly wounded in a scuffle, and was obliged to escape in disguise. He spent his time while living in Paris in studying the secret organizations of the continent, and in 1853 traveled through Ireland, preparing the way for the Fenian conspiracy, of which he was the head. In 1864, he was arrested at Dublin, but escaped to New York, where he was deposed by the Fenians. He returned to Ireland in 1891.

Stephenson (*stē'ven-son*), **George,** an English inventor, was born at Wylam, near Newcastle, England, June 9, 1781. His first earnings were got for herding cows at four

GEORGE STEPHENSON.

cents a day, from which he advanced to eight cents for hoeing turnips. At fifteen, he was earning $3.00 a week for tending an engine, and paying eight cents a week for lessons in reading, writing, and arithmetic, which he studied at night by the light of his engine fire. In his leisure hours he studied his machinery, taking his engine to pieces to examine its construction. His first invention was a safety lamp, called the "Geordie," for which he received $5,000 as a public testimonial. He was given the keeping in order of the engines at Killingworth colliery, and here, by permission of Lord Ravensworth, built his first locomotive in 1814, and called it *My Lord*. In 1821, he had charge of the building of the Stockton and Darlington railroad, and in 1826, of the line between Liverpool and Manchester, at a salary of $5,000 a year. When the first line was finished, in 1825, a trial was made of different locomotives, resulting in the choice of the *Rocket*, made by his son Robert and himself, which traveled at the then unheard-of rate of 30 miles an hour. His life now became a very busy one. Railroads sprang up all over the country, and his time was spent in superintending their building, sometimes dictating letters and reports for twelve hours at a time. He was besieged by inventors anxious for a recommendation, offering large sums for the use of his name, but he would never give it except to an invention of real merit. His later years were spent in the quiet pursuits of the country, growing fruits in his garden, nutting in the fall, and watching the nest-building birds in the spring with all the delight of his earlier life. His biography by Smiles is considered one of the best biographies in the language. He died Aug. 12, 1848. See *Life*, by Smiles.

Ste'phenson, Robert, the son of George Stephenson, was born near Newcastle-upon-Tyne, Oct. 16, 1803. He helped his father in the survey of his first railroad and spent three years as civil engineer in South America. On his return, he had charge of his father's locomotive works and assisted in building the famous *Rocket*, which won the prize as the best engine at the opening of the first passenger railroad in England. He was his father's assistant in all the railroad building that followed and rose to the highest rank in his profession. Among his great works are the Britannia and Conway tubular bridges, the Victoria bridge at Montreal, and two bridges across the Nile at Damietta. He was a member of parliament, received many honors from abroad, and at his death, Oct. 12, 1859, was buried in Westminster Abbey. See *Lives of the Engineers*, Vol. v., by Smiles; *Life of Robert Stephenson*, by Jeaffreson.

Stereoptican (*stē're-ŏp'ti-kŏn*). See MAGIC LANTERN.

Ste'reoscope, an instrument which combines two different pictures of the same object into one, making it appear solid. Two photographs are taken of the object, one as it appears when looked at with the right eye and the other as it looks with the left. These are transposed, that is, the right picture placed on the left, and vice versa, mounted, and introduced into an instrument having a double lens, or a single lens cut in two, which makes the two images blend into one and stand out as they seem to when looked at by the eye alone. The lenses act as magnifying glasses, and also incline toward each other, which helps to blend the pictures. The stereoscope was first invented, in 1838, by Sir Charles Wheatstone. See *Stereoscope*, by Brewster.

Ste'reotyping is the art of making solid casts of pages of movable type, to be used in printing. When the pages of matter to be printed are ready for the press, casts are taken from them, either in type metal or in copper. Type metal, which is used in stereotyping, is an alloy of lead, antimony, and tin, and sometimes copper, and is much cheaper than copper, which, however, is the more durable, so is used where large numbers are to be printed. Taking the casts of the printed sheets in copper is called electrotyping (which see). Stereotyping was invented by William Ged, an Edinburgh goldsmith, about 1725. A cast is first made by pouring a mixture of plaster of paris and water over the types, and when it is hardened, or set, taking it off and drying it in an oven. This cast, which is a perfect copy of the page to be printed, is dipped into the melted type metal, forming a cast of the metal, which is trimmed and planed to fit the block on which it is to be mounted. This cast is called a stereotype plate. The process used now is the invention of Genoux in 1829, called the papier maché

process. It is much cheaper and more rapid, and has come into general use. Folds of soft, thin paper, pasted together and wet, are laid on the face of the type and beaten with a hard brush, so as to fit in all the holes in the type. The hollows made in this way on the outside of the paper are filled with clay and brown paper pasted over, and the whole is dried till it can be lifted off the type, when the cast of type metal is made from it by pouring in the hot metal. The paper cast can be kept and any number of new casts made from it. In printing newspapers, the stereotype plates are made to fit round a cylinder, and the paper is pressed into the holes of the type by a roller. In the large newspaper offices a cast can be made in ten or twelve minutes. See *Stereotyping and Electrotyping*, by Wilson.

Sterne, Laurence, a British writer, was born at Clonmel, Ireland, Nov. 24, 1713. He studied at Cambridge and became a clergyman. In 1759, he wrote the first two volumes of the *Life and Opinions of Tristram Shandy*, which has made him forever famous. Its success was signal and he became the "lion" of the fashionable world. The other two volumes followed in the same year and were as heartily welcomed as the earlier ones. The rest of the work, which reached nine volumes, was written at Coxwold, where he had moved from his Yorkshire parish. *The Sentimental Journey through France and Italy*, published in 1768, was the result of a tour through those countries in 1765. He published also two volumes of sermons. His fame rests on his humor and the immortal characters of "Corporal Trim," "Yorick," and "My Uncle Tobey," found in *Tristram Shandy*. He died at London, March 18, 1768. See *Life*, by Fitzgerald; and *Sterne*, in the "English Men of Letters" series, by Traill.

Stettin (*stĕt-tēn'*), a Prussian city, is the capital of Pomerania. It is on the river Oder, sixty miles northeast of Berlin. The citadel and several forts which formed the ancient fortifications were removed in 1874. The churches of St. Peter (1124), and of St. James, founded in the 14th century, the palace, town hall, two ornamental arches, and several fine squares, are among the noticeable features of the city. It is one of the chief seaports of Germany, and manufactures soap, matches, clothing, sugar, paper, sewing machines, and bricks; has oil refineries; and is engaged extensively in shipbuilding. Stettin was the seat of a princely dynasty, from 1107–1637; was occupied by Sweden from 1648–1720, and by the French from 1806–13. Population 210,680.

Steu'ben, Frederic William Augustus, Baron, a general in the Revolutionary war, was born at Magdeburg, Prussia, Nov. 15, 1730. He served when only fourteen in the siege of Prague, and rose in the army until, in 1752, he was on the staff of Frederick the Great. He came to America in 1778 and offered his services to Washington, who gladly accepted them, as it was in the dark days of Valley Forge. He was appointed inspector-general, and remodeled the army. He took part in the siege of Yorktown, and spent his whole fortune in clothing his men. Congress in 1790 voted him $2,400 yearly and a township of land near Utica, N. Y., where he died Nov. 28, 1794. See *Life*, by Kapp.

Steu'benville, a city in eastern Ohio, is on the Ohio river sixty-eight miles below Pittsburgh. It is in a rich farming country, with large coal mines and natural gas, and has a large trade. It stands high on the right bank of the river, is well laid out, and has foundries, machine shops, rolling mills, boiler works, and factories of nails, white lead, paper, glass, beer, etc. The city is built on the site of Fort Steuben, which was erected in 1787 and named after Baron Steuben. The permanent settlement was made in 1797. Population 14,349.

Ste'vens, Alfred, an English sculptor, was born at Blandford, Dorset, England, in 1818. His great work which ranks him among the great sculptors of England, is the monument of Wellington for St. Paul's Cathedral, London, one of the finest pieces of modeling in England in the 19th century. It was begun in 1856, but was left still unfinished at his death May 1, 1875. In 1892, it was moved from the side chapel, where it had been almost hidden, to the place for which it was originally intended. See *Alfred Stevens and His Work*, by Stannus.

Ste'vens Point, a town in Wisconsin, is on the Wisconsin river, 161 miles northwest of Milwaukee. It has a lumber trade and a number of mills. Population in 1900, 9,524.

Ste'vens, Thaddeus, American statesman, on the Republican and antislavery side, was born at Peacham, Vt., April 4, 1792, and died at Washington, D. C., Aug. 11, 1868. After graduating in 1814 at Dartmouth college, he studied law and practiced at Gettysburg, Pa., and was subsequently drawn into politics, serving for a time in the state legislature in the Whig interest, and becoming an active advocate of the public school system of Pennsylvania. In the Whig interest, he later on served several terms in congress, and meanwhile removed to Lancaster, Pa., where he rose to a prominent position at the bar. In congress, in 1850, he opposed the Clay compromise measures, including the Fugitive Slave law. In 1858, he was returned to congress as a Republican, and became one of the ablest leaders of that party, and manifesting great powers as an orator. He was a pronounced advocate of emancipation and the enfranchisement of the negro; was bitterly hostile to the seceding states, and stringent in his proceedings against them. He lived to take an active part in the unsuccessful impeachment

of President Johnson, and to see the readmission into the Union of the first group of reconstructed secession states. Though skeptical in his religious opinions, he was reverent in his attitude to Christianity — the devout faith of his mother. Part of his estate he bequeathed to an orphan asylum at Lancaster, Pa., to be open to both white and colored children.

Ste'venson, Adlai E., was born in Christian county, Ky., Oct. 23, 1835. After graduating at Central college, he studied law and was admitted to the bar in 1858. He began the practice of law in Metamora, Ill., and remained there for ten years. He then removed to Bloomington, was elected congressman for that district in 1874, and again in 1878. He was appointed first assistant postmaster-general in 1885 by President Cleveland, and in 1892 was elected Vice-president of the United States on the ticket with Grover Cleveland.

Ste'venson, Robert Louis Balfour, a Scotch writer, was born at Edinburgh, Nov. 13, 1850. He studied at Edinburgh and fitted himself for the bar, but soon turned his attention to literature. He obtained material for his works by journeys on foot and by canoe in France, a trip across the Atlantic as a steerage passenger, and across America in an emigrant train, and a residence for his health in Samoa. His first articles in the *Cornhill* and other periodicals attracted attention by their style. His earliest works included *An Inland Voyage*, *Travels with a Donkey in the Cevennes*, and some of his finest essays in *Familiar Studies of Men and Books*, *A Child's Garden of Verse*, published in 1885, and *Underwood* and *Ballads* are volumes of poetry. His novels include *Kidnapped*, *The Black Arrow*, *The Master of Ballantrae*, and *The Wrecker*. But the one which has perhaps made him most famous, as a new contribution to literature, is the *Strange Case of Dr. Jekyll and Mr. Hyde*, published in 1886. His works on Samoa, *Across the Plains*, and *Memories and Portraits*, indicate the great variety of his talents. He died at Apia, Samoa, Dec. 8, 1894. See *Life*, by Graham Balfour.

R. L. STEVENSON.

Stevinus, Simon, a Dutch mathematician, statesman, and soldier, born 1548; died 1620. Very little is known of his early career. His achievements are principally the following:—

1. He invented a number of ingenious proofs for certain theorems in statics and hydrostatics. He also constructed a carriage which was successfully operated by sails.

2. He left an important treatise upon the subject of fortifications.

3. He introduced and advanced the use of (but did not invent) the system of double entry in bookkeeping, and the use of decimal fractions.

He held a number of important offices under the Dutch government. For a detailed account of his work in science, see Mach's *Science of Mechanics*.

Stew'art, Balfour, a British scientist, was born at Edinburgh, Nov. 1, 1828. In 1859, he was in charge of the Kerr observatory, and in 1870 he was professor of physics at Owens' college, Manchester. He is known as one of the founders of spectrum analysis, and his name is associated with such subjects as terrestrial magnetism and the relation between sun spots and temperature. His *Treatise on Heat*, *Elements of Physics*, *Conservation of Energy*, were all used as textbooks. He died in Ireland, Dec. 19, 1887.

Stew'art, William Morris, United States senator and lawyer, was born at Lyons, N. Y., Aug. 9, 1827, spent his early life in Ohio, and entered Yale college; but before graduating was attracted by the gold discoveries in California, and proceeded thither in 1850. Here he mined in Nevada county, Cal., and amassed wealth, after which he studied law and was admitted to the California bar. In 1854, he was attorney-general of that state; but some years later he removed to Virginia City, Nev., and became interested once more in mining, and in the development of the famous Comstock lode. In 1861, he was chosen a member of the territorial council, and two years later member of the constitutional convention. From 1864 to 1875 he was United States senator from his district, and became prominent as a free-coinage advocate. Meanwhile he resumed the practice of his profession, though, in 1887, he was again elected to the United States senate, of which chamber he continues to be a member.

Stickleback (*stĭk'k'l-băk*), the name for small fishes with spines on the back. There are about twenty species, all inhabiting the northern hemisphere, and their spines vary from two to fifteen. They live in fresh, brackish, and salt waters. The common freshwater stickleback is about four inches long, with three or four spines. It is abundant in streams in the United States and in Europe. In America it ranges from New York to Greenland. The brook stickleback is abundant in small brooks, from New York to Kansas, and north to Greenland. Its length is two and one-half inches, and there are five spines on the back. The largest stickleback is the many-spined stickleback, a salt-water fish found on the eastern side of the Atlantic. The sticklebacks are nearly all nest builders.

The males alone build the nests and guard them. They are provided with glands which open on the ventral surface, secreting a gelatinous substance used in holding the parts of the nest together. The nest is made of stems of water plants and is attached to a stationary object. It is barrel-shaped with two openings, through which a current of water continually passes. Several females deposit eggs in one nest in different layers. They are fertilized by the male as soon as laid. He keeps guard, not only while the eggs are hatching, but after the young fish are born.

Stig'ma (in plants), a specially constructed surface in connection with the carpel, for receiving the pollen. The surface is composed of papillate outgrowths which secrete a sugary solution. By means of this solution the pollen grains are held and nourished for the development of the pollen-tubes. The stigma usually occupies some special region of the style, either its more or less broadened apex, or a line or band down one side. See FLOWER.

Stilicho (*stil'i-kō*), **Flavius,** a famous Roman general, was born about 359 A. D. He rose rapidly, and in 384 was sent as ambassador to Persia. In 394, he was governor of the western empire, as guardian of Honorius, the son of the emperor, who had been given into his charge by Theodosius. On the death of Theodosius he marched against Alaric, and also procured the death of his rival Rufinus, who had command of the eastern empire. He again attacked Alaric in northern Italy, defeating him at Pollentia and Verona (403). He desired to help his own family to the imperial succession by marrying his son to the daughter of Theodosius, as he had already succeeded in marrying his daughter to the son of Honorius. To forward this plan he made an alliance with Alaric, but the great inroad of 200,000 barbarians compelled him to abandon his alliance. He forced them to surrender, and large numbers were sold as slaves. Honorius, the emperor, was excited against Stilicho by an enemy of his at court, and the army was induced to revolt. Stilicho fled to Ravenna, where he was murdered Aug. 23, 408. Three months after his death, Alaric and his Goths were at the gates of Rome.

Still'water, a town in Minnesota, on the St. Croix river, eighteen miles by railroad from St. Paul. It has the lumber trade of the St. Croix valley, and has flour mills, sawmills, a foundry, and a large barrel manufactory. Population 12,318.

Stipule (*stip'ul*), a constituent part of many foliage leaves, usually occurring as a pair of small more or less leafy outgrowths on each side of the base of the petiole, as in clover. Sometimes stipules become much modified, as when in the smartweeds they unite about the stem and form a short sheath, or when they appear as thorn-like processes. They are very constant in their occurrence in certain groups of plants, and are therefore of considerable service in classification.

Stir'ling, a town of Scotland, on the River Forth, twenty-nine miles from Glasgow. The castle stands on Castle hill, which is 420 feet above the sea. Most of the present castle belongs to the days of the Stuarts, whose sovereigns often kept court there. There is the Douglas room where the earl of Douglas was stabbed by James II. in 1452; the parliament hall of James III.; the palace of James V. and the chapel of James VI.; the church of the Holy Cross; the statue of Bruce; the guild hall; the old and the new bridges; the Smith institute, with art gallery, reading room, and museum, are other interesting places. The town is connected with nearly all the most important events in Scottish history, the deaths of Alexander I. and William the Lion; Wallace's victory at Stirling bridge; a siege of the castle by Edward I.; birth of James III.; crowning of Queen Mary; slaughter of Lennox and the capture of the castle by Monk. Stirling has manufactures of tartans, tweeds, carpets, agricultural implements, etc. Population 18,895. See *History of the Chapel Royal of Stirling.*

Stir'ling, James Hutchinson, a modern Scottish philosopher, was born at Glasgow, June 22, 1820. He studied medicine and practiced a short time in Wales. He went to Germany to study philosophy, his first work, *The Secret of Hegel*, published in 1865, giving him at once a high rank among philosophers. He has written also a *Text-Book to Kant; Sir William Hamilton*, an attack on his philosophy of perception; *Lectures on the Philosophy of Law*, and *As Regards Protoplasm.* Other miscellaneous works are *Jerrold, Tennyson, Macaulay*, and *Burns in Drama.*

Stock'holm, the capital of Sweden, is built on several islands and a part of the mainland, between a bay of the Baltic and Lake Mälar. It is considered one of the most picturesque sites in Europe. The palace dating back to 1697, the St. Nicholas church, in which the kings are crowned, the House of Nobles, the town house, and a magnificent granite quay are on the island called the "Town"; the Knight's island, west of the Town, is occupied by public buildings, such as the houses of parliament, the old Franciscan church in which many of the kings of Sweden have been buried, and the chief law courts. In Norrmalm, a district north of these islands, is the national museum with very valuable collections of antiquities, coins, and paintings, the academy of fine arts, the Hop garden with a statue of Linnæus, the royal library of 250,000 volumes, and an observatory. Ship island, lying east of the Town island, is the headquarters of the Swedish navy, and still farther east is the beautiful island of the zoological gardens. The islands are con-

nected with each other and the mainland by bridges, and small steamers ply rapidly between them. Though the harbors are closed for three or four months every winter, there is a large trade, and considerable manufacturing of sugar, tobacco, silks, ribbons, candles, linen, cotton, and leather. Stockholm was founded by Birger Jarl in 1255, besieged by the Danes in 1389, captured by Christian II. of Denmark in 1520, when a terrible massacre followed, known as the "blood bath of Stockholm." The city contains 302,462 inhabitants, the mass of whom are Scandinavians, and adhere to the Lutheran Protestant church. There is a state faculty of medicine with 273 students, and a private philosophical faculty. Public elementary education is free and compulsory, and all children not attending the public schools must furnish proofs of having been privately educated.

Stock'port, a city in England, thirty-seven miles east of Liverpool. It is built on the slopes of a deep ravine where two small rivers unite to form the Mersey, which is here crossed by a railroad viaduct, 111 feet high and 1,875 feet long. There is a 14th-century church, rebuilt in 1817, market hall, free library, museum, and St. Peter's square, with a statue of Richard Cobden. Stockport was first the site of a Roman station, then of a Norman castle, which was taken by Prince Rupert in 1644. It is now an important seat of the cotton industry, and has grown rapidly, in spite of riots and strikes and the cotton famine of 1861–64. There are also iron and brass foundries, engine and machine shops. Population 75,253.

Stock'ton, a city of California, on an arm of the San Joaquin river. It has a good harbor and the river is navigable at all seasons from San Francisco. The city is supplied with water by artesian wells. There is a convent, a state lunatic asylum, and factories of ironware, paper, woolens, flour, soap, carriages, etc. Population 17,506.

Stock'ton, Francis Richard, American author and humorist, was born at Philadelphia, April 5, 1834, and after graduating at the high school of that city he took to journalism as a profession, and to contributing to the magazines (under the signature of "Frank R. Stockton"). Joining the staff of *Scribner's Monthly*, he wrote much for it, and for *St. Nicholas*, of which he became assistant editor, and in which appeared many of his delightful stories for the young. He has since become a prolific and industrious author, his stories revealing a quaint but unobtrusive humor, with a brightly graphic quality, and a literary style that commends his work to the educated and refined. His more prominent works: *The Ting-a-Ling Stories*, *Rudder Grange*, *The Rudder Grangers Abroad*, *The Late Mrs. Null*, *The Lady or the Tiger*, *The Hundredth Man*, *Pomona's Travels*, *Adventures of Captain Horn*, *The Clocks of Rondaine*, *The Casting Away of Mrs. Leeks and Mrs. Aleshine*, *The Merry Chanter*, *The Dusantes*, *The Girl at Cobhurst*, *The House of Martha*, *The Watchmaker's Wife*, etc. Died Apr. 20, '02.

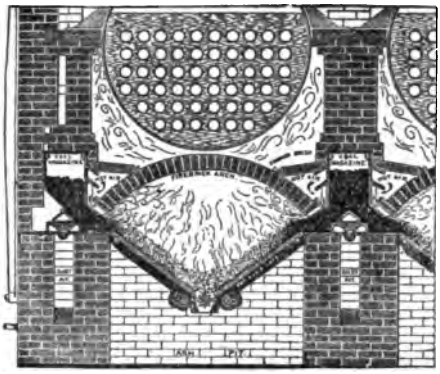
F. R. STOCKTON.

Stock'ton, Robert Field, an American naval officer, was born at Princeton, N. J.. in 1795. He entered the navy in 1811, went to Africa in 1821, and helped to secure the republic of Liberia for the colonization society. He was sent to the West Indies against the pirates and served in the Mediterranean. In 1845, he was sent to the Pacific coast, and the next year with Frémont conquered California for the United States. In 1851, he was elected United States senator. He died at Princeton, N. J., Oct. 7, 1866.

Stod'dard, Richard Henry, American poet, critic, and man of letters, was born at Hingham, Mass. July 2, 1825, and for a time attended school in New York, after which he worked as an iron moulder, meanwhile with love and assiduity cultivating the Muses. He subsequently held a position in the New York customhouse, was confidential clerk to General McClellan, city librarian in New York, and reviewer for the New York *Mail and Express*. With poetic power, he possesses the true lyrical note, with an affluent imagination, and much love of the beautiful. He is well endowed as a critic, and his prose is that of a scholar and literary student. Many of his shorter poems have found their way into the heart, such as his *The Two Brides*, *The Flight of Youth*, *Along the Grassy Slope I Sit*, *Pain in Autumn*, and *The Dead*. His chief published volumes embrace *The Book of the East*, *A Century After*, *Songs of Summer*, *Poems* (complete edition, 1880), *The Lion's Cub and Other Verse*, *Under the Evening Lamp*, *Adventures in Fairy Land*, *The King's Bell*, together with a *Life of Humboldt*, a *Life of Washington Irving*, etc. He has also edited *The Bric-à-Brac*, and the *Sans Souci* series.

Stok'ers (mechanical), an apparatus for feeding furnaces with coal by mechanism operated by power. Finely broken coal is used, and is ordinarily stored in elevated bins in front or over the furnace. From these elevated bins it runs down through chutes into the coal magazine of the stoker. It is then fed regularly to the fire by some mechanism. In the Roney stoker, coal is carried down to the fire on a series of connected

rocker bars, arranged on an incline. In another common furnace the coal is pushed down the inclined sides of the furnace by an oscillating pushing bar. The advantages of a



GRATE FEED OF A MECHANICAL STOKER.

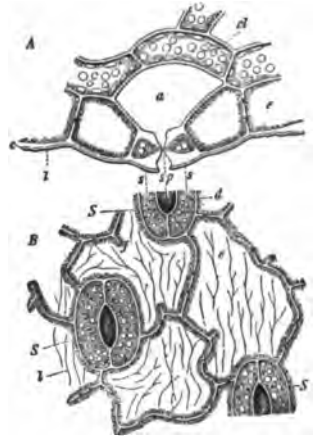
mechanical stoker are that coal is fed more uniformly, smoking is decreased, a lower grade of coal can be used with advantage, and hand labor is saved. Mechanical stokers are to-day used in many large stationary furnaces.

Stoke-upon-Trent, a manufacturing town in Staffordshire, England, on the Trent river. It is a modern town noted for its factories of porcelain, earthenware, tiles, and tesselated pavements, which are among the largest in the world. There is also carried on coal mining, bricklaying, and iron works. There are statues of Wedgwood and Minton in the city. Population 35,352. See *Borough of Stoke-upon-Trent*, by Ward.

Stolon (*stō'lŏn*), a branch especially adapted for propagation, as in the ordinary houseleek. The houseleek, surrounded by its stolons, each bearing a young plant at its tip, is sometimes called "hen and chickens." An equivalent word is "offset."

Stom'ach, an organ of digestion, present in some form in all animals above the sponges, with the exception of a few degenerated parasites. It is merely a receptacle for the food, and is provided with glands which secrete a digestive fluid. Digestion is, however, carried farther and completed in the intestine and, therefore, the stomach is not the sole organ of digestion. The stomach of the human body is a sac located on the left side just below the diaphragm. It has four coats: an outer, firm, serous coat; a muscular coat, with fibers arranged in longitudinal, transverse, and oblique directions; a coat of loosely woven fibrous tissue; and an inner, mucous coat. The glands which secrete the gastric juice are derived from the latter coat. There are two varieties, those nearer the heart, called cardiac glands, and those at the other end of the stomach where the intestine is joined, called the pyloric glands. The latter are the more important. The stomach is under control of the nervous system, both as to its movements and as to the secretion of gastric juice. When food is introduced into the stomach the secretion of gastric juice is stimulated through the nervous system. The gastric juice contains a ferment called pepsin, which acts especially on proteids like lean meat, white of eggs, gluten of bread, etc. This action takes place in the presence of acid, and in the glands are certain cells which provide hydrochloric acid in small amount. When this is deficient, grave stomach disorders arise. The food is reduced to a condition called chyme and is passed on into the intestine. The object of digestion is to render food soluable so that it may pass by absorption through the walls of the stomach and intestine. This is not a process depending upon life, as it can be performed with artificial gastric juice outside the body. The characteristic action of the gastric juice is upon proteids, while the pancreatic juice, which is introduced into the intestine, is a universal digester, of greater efficiency than the gastric juice. It aids in digestion of starches and fats as well as in completing that of the proteids.

Stomata (*stō'ma-ta*) (in plants). Narrow openings are developed in the epidermis of all aerial parts of plants which require and emit gases. (See AERATION.) Gaseous ex-



STOMATA AND LEAF.

changes especially abound in green tissues; hence stomata are chiefly displayed by the foliage leaves of the higher plants. Each stoma consists of two specially organized epidermal cells, called guard cells, which are crescentic in surface view, and being in contact by their concave faces leave a lens-shaped opening between them. This opening leads into the system of intercellular passageways among the working cells, and thus provides for a free exchange of gaseous substances between the working cells and the

outside air. The guard-cells change form with the varying amounts of moisture in the air, and so regulate the size of the opening between them. Stomata have been called "automatic gateways" on account of this peculiar power of the guard cells. See LEAF, and TRANSPIRATION.

Stone Age is a term used to designate a stage of culture in man's development, not a chronological period in geological history. It refers to the period among any people when the use of metals is unknown, or, if known at all, does not involve the knowledge of smelting. At such a time stone is largely used in making implements and tools, though other materials, such as wood, bone, and shell are also employed. The stone age is known to have existed in Europe many hundreds of years ago; in North America it continued among the Indians until the last century; in some other places, it probably exists at the present time.

The great mass of evidence for the Stone Age has been gathered in Western Europe, and that period has been subdivided into the Paleolithic (old stone) and Neolithic (new stone) eras. During the earlier time the implements were rudely chipped and left rough and irregular; in the later time they were often highly polished and finished with great care.

Paleolithic man is thought to have existed in southern Europe, while much of the continent was covered with ice. His presence there is known by the chipped flints found in place in beds of gravel and loess of France, which Prestwick and Lyell identify as drift formations from the early ice invasion.

Neolithic implements, of which specimens are much more numerous, have been collected in the oldest lake-dwellings of Switzerland, and especially in Denmark. They are nowhere associated with river gravels, nor have Paleolithic remains been found in Denmark. In that country the polished stone implements and bits of pottery found in the shell-heaps or Kjökken-Mödding (kitchen-middens) indicated that man had reached a higher stage of culture by the time he had reached that region in his northward migration after the retreating ice-sheet.

In America, the same subdivision of periods has been attempted, but thus far the evidence seems to show the presence of Neolithic man only. The specimens brought forward to prove the presence of Paleolithic man seem to be rude "rejects" thrown aside before completion.

Stone, Lucy (Blackwell), American reformer and advocate of woman's rights, was born at West Brookfield, Mass., Aug. 13, 1818, and died at Dorchester, Mass., Oct. 18, 1893. Graduating at Oberlin college in 1847, she devoted herself to the advocacy of woman suffrage, and to the cause of antislavery, of which she became a zealous worker. She lectured widely in favor of woman suffrage, organizing wherever she went local societies of the Woman's Suffrage Association, of which she was one of the founders, as well as editor of the (Boston) *Woman's Journal*, which was its mouthpiece. She aided in organizing, in 1850, the first national Woman's Rights convention at Worcester, Mass., and was always zealous in the cause she held dear to her heart. In 1855, she married Henry B. Blackwell, though stipulating to bear her maiden name.

Stone Circles, or **Standing Stones,** groups of stones, sometimes two or three standing alone and sometimes arranged in circles, found in Britain, Scandinavia, France, etc. They were called Druidical circles in Britain, Cromlechs in France, and Dom-rings in Scandinavia. Sometimes they are bowlders rolled into place, and sometimes pillar stones, fastened in position by smaller ones at the base. Somctimes there is a single circle, and again there will be one or two smaller circles within. Examination of these circles in Scotland proves that they were cemeteries of the bronze age. The largest stone circle in Scotland is that of Stennis, in Orkney. It is surrounded by a trench thirty feet wide and six feet deep, inclosing two and a half acres. There are thirteen stones still standing, the highest being fourteen feet.

STONE'HENGE is a circle of stones on Salisbury Plain, England, and was classed as one of the four wonders of England. It is a set of circles and oval figures. The first circle has pillars of stone about thirteen feet high and four feet apart, and stones placed across on top. There are about 140 stones of the different circles, some being twenty-three feet high. It is also found to be a burial place. The stone circles of Norway and Sweden seem to be burial-places of the iron age. The circles are rare south of the Baltic, there being only a few in France and Algeria. See *Rude Stone Monuments*, by Fergusson.

Stones, Precious, are certain mineral substances used in jewelry, and for other ornamental purposes. They are called precious because of their rarity and expensiveness. The diamond, ruby, sapphire, oriental amethyst, and emerald stand first in the list of precious stones, because of their brilliant color, luster, their hardness and durability, and their rarity. The topaz, garnet, turquoise, tourmaline, opal, agate, jasper, and onyx are of the second class, while there is still a large class of stones used for ornaments, such as lapis lazuli, malachite, and the moonstone, which are not called precious stones. There are also two substances, derived from animals, used in jewelry, pearls and corals, and also amber, which is a fossil resin. The cutting and polishing of precious stones is necessary to bring out the sparkle and luster, so much valued. When the sparkle is desired the stone is cut with many faces, or "facets," as

in the diamond, but when the color is important, it is cut with a smooth and usually rounded surface. The hardness of the stone adds to its value, as it admits of a higher polish, retains it longer and wears better. The diamond is the hardest of the precious stones. The great value of these stones has led to many efforts to produce artificial imitations, but without success. The usual imitations are made of a soft flint glass, called stress or paste, which is colored, and sometimes has thin plates of the real stone over or under it. See DIAMOND, PEARL, SAPPHIRE, etc.

Stoneworts (*wûrts*), the common name of species of *Characeæ*, which see.

Stony Point, a rocky point on the Hudson river, forty-two miles north of New York. There was a fort here and one on the point opposite during the Revolutionary war, which were captured by the British, but the Stony Point fort was retaken by Anthony Wayne, in a bold night attack, July 16, 1779.

Stor'age Bat'tery, a form of voltaic battery in which the energy, when once used up, may be replaced by a process known as "charging."

Like almost every other form of voltaic cell, the storage cell consists of two conductors of the "first class," and one conductor of the "second class." In this case the conductors of the first class are *lead* and *lead peroxide*, while the conductor of the second class is a solution of sulphuric acid.

This form of voltaic cell was devised in 1860 by Planté, a Frenchman. He started with two lead plates in sulphuric acid. By passing an electric current from one of these plates through the acid to the other, he succeeded in oxidizing the anode, while the cathode remained metallic lead. By frequently changing the direction of the current passed through the cell the lead plates were rendered porous and spongy, and made to present a large surface. This process is known as "forming the plates." Finally a current is passed through the cell in one direction until one plate is thoroughly oxidized, while the other remains spongy metallic lead. This process is known as "charging the cell."

The charging simply restores the oxygen to the positive plate and removes the oxygen from the negative plate. Voltaic cells are divided into two classes according as they require charging or not. Those which do require charging are called *secondary* cells; while cells of the Daniell or Bunsen type which are made up once for all and continue to work until one of the electrolytes or one of the electrodes is exhausted are called *primary*.

In 1881, Faure devised a process of putting a paste of red lead (lead peroxide) on the positive plate and shortening the process of forming. But in the very best cells of recent years there has been a partial return to the process of Planté. When a storage cell is being used the current, *in the cell*, flows from the spongy bed plate to the plate which is covered with lead peroxide (PbO_2). The result is that the former is oxidized and the latter reduced from lead peroxide to lead oxide. When all the peroxide is used up, the cell must be charged again.

From the preceding it is evident that what is stored up in this cell is chemical energy, and not electricity, as is sometimes popularly supposed. The great merit of its storage cell is its high electrical pressure, more than two volts, combined with a very low internal resistance. This low resistance permits the use of enormous currents without wasting much energy inside the cell.

Storage cells are used for an endless variety of purposes; but their principal use may be reckoned as that of a "booster" in helping the dynamo during the busy hours at the electric light station and at the street railway power house. Many tons of storage cells are employed also in driving automobiles and small launches. Storage cells are often called "accumulators."

Stor'er, Bellamy, American diplomat and lawyer, was born at Cincinnati, Aug. 28, 1847, and graduated at Harvard and the Cincinnati Law school. In 1870, he was admitted to the bar, and began to practice in Cincinnati. From 1891 to 1895, he was member of the 52d and 53d congresses, acting with the Republican party. In 1897, he was appointed United States minister to Belgium, and was transferred (April, 1899) from the embassy at Brussels to the post of United States minister to Spain, to fill the vacancy occasioned by the departure from Madrid of Stewart L. Woodford, on the outbreak of the war with Spain. He still (1901) remains at the United States legation at Madrid.

Stork, a large heron-like bird with bill much longer than the head and very stout at

STORK.

the base. The common migratory stork of Europe is the best-known member of the

family. It is a friendly bird, nesting on housetops, old chimneys, and steeples, as well as on tall trees, and is regarded as a bird of good omen. It breeds in Holland and Germany, but not in France, Italy, or Russia. It is about three and one-half feet long, white, except the wings which are partly black. In the autumn these birds gather in large flocks and migrate to Africa, where they spend the winter. They frequent marshy places and feed on frogs, fishes, snakes, slugs, young mammals, and insects. There are about twenty species of storks living in tropical and temperate parts of the world. There is only one form that breeds in North America, viz., the wood ibis, which is about the length of the European stork. It is mainly white, with glossy black on the wings and tail. The head and upper part of the neck have no feathers and are of a dusky color. It breeds as far north as the southern limit of Illinois, and is an occasional summer visitor farther north. See ADJUTANT BIRD.

Storm, a violent disturbance of the weather, especially as regards wind and rain. By means of simultaneous observations of the barometer it has been found that the atmosphere of the earth is made up of regions of high and regions of low pressure — or as they are called by meteorologists — anti-cyclones and cyclones respectively. It is the cyclones, or regions of low pressure, rotating in the northern hemisphere in a direction contrary to the hands of a watch, that constitute most of our storms. In the United States these cyclones originate mostly in the region west and northwest of the Mississippi — between the Rocky mountains and the Mississippi river, or in the region about the gulf of Mexico. Many of the storms of the Atlantic originate about the gulf of St. Lawrence; while the storms of Great Britain take their rise mostly in the mid-Atlantic.

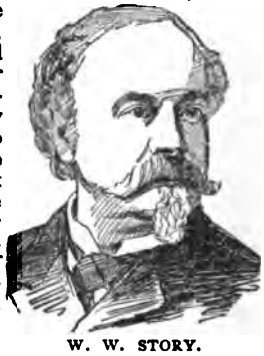
It is by knowing the general trend and rate of motion of these cyclones, and by studying the latest telegraphic reports, that the weather forecaster is able to predict all large storms with admirable and increasing accuracy. Thus the usual storm track in the United States is to the east and over the Great Lakes to the gulf of St. Lawrence. There is a great variety of local storms, such as the *typhoon* of the China sea and the waters about the Philippine islands, the wind storms of Arabia. the *blizzards* or heavy snow storms accompanied by driving winds, tornadoes, etc. The entire subject of storms must, however, be yet considered as an imperfectly understood department of an imperfectly developed, but highly important, science — meteorology. See CYCLONE.

Storrs, Richard Salter, an American clergyman, was born at Braintree, Mass., Aug. 21, 1821. He studied at Amherst college and at Andover Theological seminary. He was pastor of the Church of the Pilgrims, Brooklyn, N. Y., 1846–99, having had one of the longest pastorates in the city. For a number of years he was one of the editors of the *New York Independent*, and was president of the American board of missions. He was noted for his eloquence and beautiful style in the pulpit and his aptness and readiness in occasional addresses, and ranked as one of the first pulpit orators in America. He died June 5, 1900.

REV. DR. STORRS.

Sto'ry, Joseph, an American jurist, was born at Marblehead, Mass., Sept. 18, 1779. He was a graduate of Harvard. He was in the state legislature in 1805, and in 1808 entered congress. He was made a judge in the supreme court of the United States in 1811, holding the position for thirty-four years. In 1829, he became a professor in the law school of Harvard university. He was an authority on all legal questions in the United States, his works, *Commentaries on the Constitution of the United States*, *The Conflict of Laws*, and *Equity Jurisprudence*, being very valuable. He died at Cambridge, Mass., Sept. 10, 1845. See *Life*, by his son.

Sto'ry, William Wetmore, American sculptor and poet, was born at Salem, Mass., Feb. 19, 1819 (the son of Joseph Story, the distinguished jurist), and after graduating at Harvard studied law and was admitted to the bar. Among the product of his work as a lawyer are *Reports of Cases* (1842–47), a *Treatise on the Law of Contracts*, on *The Law of Sale of Personal Property*, together with a memoir — *The Life and Letters of Joseph Story*. In 1848, he abandoned law for sculpture, and to assist him in his study of fine models he removed to Rome where he afterward chiefly resided, until his death at Vallombrosa, Italy, on Oct. 7, 1895. His allegorical statues — *Cleopatra*, *Medea*, and *The African Sibyl*, *Simiramis;* statues of George Peabody, of Edward Everett, of Francis Scott Key, and the busts of Lowell, Bryant, Theodore Parker, Josiah Quincy, and of his father — represent the bulk of his



W. W. STORY.

achievement in art. In literature, he published from time to time, poems, essays, and rambles in Italy. The chief of these works which show his culture and sympathies are *Roba di Roma*, *Conversations in a Studio*, *The Castle of St. Angelo and the Evil Eye*, *Poems*, *Excursions in Art and Letters*, and *A Poet's Portfolio*.

Stowe, Harriet Beecher, an American writer, was born at Litchfield, Conn., June 14, 1811. She belongs to the celebrated Beecher family, being the daughter of Dr. Lyman Beecher, and the sister of Henry Ward Beecher. She was noted as a child for her fondness for writing, and at twelve years of age astonished her teachers with a composition on the question, "Can the immortality of the soul be proved by the light of nature?" Moving to Cincinnati with her father's family, she there married Calvin E. Stowe, then a professor in Lane Theological seminary. In that region and through the servants employed in her own family she learned much of the evils of slavery. Her husband's connection with many prominent abolitionists, and his knowledge of the workings of the underground railroad; a pro-slavery riot in the city, when many of the intended victims were concealed and fed by herself and her friends; a sojourn of a brother in the south, with his observations on the slave trade; all helped to fit her for her work. Her first published volume was made up of sketches written for the papers and periodicals of the day, and called the *Mayflower*. In 1850, her husband became a professor in Bowdoin college at Brunswick, Me., and there the great American novel, *Uncle Tom's Cabin*, was written. The characters were, many of them, taken from life, and many incidents were obtained from her brother's journal of his southern tour, and others from the lips of fugitives from slavery. The story appeared first as a serial in the *National Era*, a paper published at Washington, D. C., and made a great sensation, bringing the author both unexpected fame and undreamed-of financial returns. It was translated into many foreign languages, including Russian, Polish, Wendish, Armenian, Arabic, Chinese, and Japanese, and has been brought out on the stage repeatedly. More than a million copies, probably, have been printed in the English language. Besides its power as a story the book had a strong influence in bringing about the Civil war, as it opened the eyes of the people to the evils of the system of slavery. Other works of Mrs. Stowe's are, *Dred*, *The Minister's Wooing*, *Agnes of Sorrento*, *Old Town Folks*, and *My Wife and I*. She died at Hartford, Conn., July 1, 1896.

HARRIET BEECHER STOWE.

Stradivari (*strä-dē-vä'rē*), or **Stradivarius Antonio,** a celebrated Italian violin maker, was born at Cremona, Italy, in 1644. Besides violins, he made viols, guitars, and mandolins. His instruments are known for their finish and fine tone. He was the first to finish them neatly on the inside. The great care with which he selected and cut his wood, the study he gave to the shape and proportions, and the luster of the varnish used, all combined to make an instrument without a rival. They are carefully preserved by those possessing them, and bring great prices, ranging from $1,000 to $3,000. Stradivari died at Cremona, Dec. 17, 1737.

Straf'ford, Thomas Wentworth, Earl of, an English statesman, was born at London, April 13, 1593. He studied at Cambridge, traveled in France and Italy, and entered parliament in 1614. In the parliamentary struggle with Charles I. he sided with the opposition, against "not the king, but his evil ministers." In 1628, he was made president of the Council of the North, by Charles I., and in 1632, governor of Ireland. There is much difference of opinion as to his administration. His aim was to make the king absolute in Ireland, and his system, called "thorough" by himself and Laud, was severe. But he brought the country into a state of prosperity unknown before or since. He raised the revenue, improved the army, cleared the seas of pirates, and introduced the cultivation of flax, which is still the most important industry of Ireland. In 1639, he became the king's principal adviser, and was made Earl of Strafford, as he had before been made Viscount Wentworth. When the Long parliament met, in November, 1640, he was charged with high treason and imprisoned. His guilt was not proved, the principal charge being his telling the king, "You have an army in Ireland that can reduce this kingdom," to which only one witness testified. But he was convicted as a man dangerous to the public liberties, and Charles gave his consent to the execution, not daring to refuse the popular clamor. "Put not your trust in princes," cried Strafford, when told of his doom, though he had written to the king, releasing him from his promise that he should not suffer in person or fortune. He was executed on Tower Hill, May 12, 1641. See *Lives*, by Foster, in "Eminent British Statesmen," and by Elizabeth Cooper.

Straits Settlements. See MALACCA.

Strakosch (*strä'kosh*), **Clara Louise (Kellogg),** American operatic singer, was born at Sumterville, S. C., July 12, 1842, and received her musical education at New York, where she made her début at the Academy of

Music in 1861. Pursuing her studies, she appeared in the season of 1864–65 as "Marguerite" in Gounod's *Faust*, as well as in *La Somnambula*, *Lucia di Lammermoor*, and other operas, achieving great success. In 1867, she appeared also in England, where the wide range and perfection of her soprano voice attracted attention. Later on, she organized an English opera company, and with it appeared in the chief cities of this country and of Europe. Of recent years, after her marriage to Mr. Strakosch, she has appeared chiefly at concerts. Her repertoire once embraced about forty operas.

Stras'burg, a city of Germany, and since 1871 the capital of Alsace-Lorraine, is on the river Ill, two miles from the Rhine. It has been strongly fortified by the Germans, who rebuilt the citadel, dating back to 1682, and placed fourteen forts on the surrounding heights. The finest building in the city is the cathedral, founded in the 11th century and not finished until the 15th. It is one of the finest Gothic churches in the world, with a spire of open stone work, 466 feet high, a magnificent rose window, 42 feet across, and in the minster the wonderful clock (see CLOCK). Other fine buildings are the Protestant Church of St. Thomas, the palace, the library, the arsenal, and the new university. The university was founded in 1621, and became famous, especially in medicine and the study of the languages, but was broken up during the French Revolution. In 1819, it was established again by the union of two academies, founded in 1803 and 1808. In 1872, it was reorganized as a German university, with new buildings, laboratories, a library of over 700,000 volumes, in place of the old one of 200,000 volumes, which was entirely destroyed in the siege of 1870, a faculty of 115, and an attendance of 1,145 students. As Strasburg stands near the borders of France, Germany, and Switzerland, it has a large trade, and also a great variety of manufactures.

Strasburg was colonized by the Romans during the reign of Augustus, and Julian here won a victory over the Alemanni in 357 A. D. It became a free town of the German empire in the 13th century. In 1681, it was seized by the French and confirmed to them by the treaty of Ryswick. After a siege of seven weeks, Strasburg surrendered to the Germans, Sept. 28, 1870. Population 150,268.

Strat'ford de Red'cliffe (Sir Stratford Canning), an English diplomatist, was born at London, Nov. 4, 1786. He studied at Cambridge, and began his political career by acting as secretary of a mission to Copenhagen. He went to Constantinople in 1808 as secretary, and in 1810 became ambassador. He negotiated the treaty between Russia and Turkey in 1812, which released the Russian army of the Danube in time to attack Napoleon on his retreat from Moscow. He was minister to Switzerland in 1814; at the congress of Vienna, as commissioner, in 1815; and minister to the United States from 1819–23. In 1825, he was again sent to Constantinople; again in 1831, on a mission to draw the boundaries of the new kingdom of Greece; and once more, from 1842 to 1858, he was ambassador at Constantinople. Here his influence was so great as to gain him the name of the "Great Elchi." He induced the sultan to begin a series of reforms, which improved the condition of the native Christians, and made every effort to prevent the Crimean war. He retired from public service at the close of the war, spending a part of his leisure in writing poetry. He died Aug. 14, 1880. See *Life*, by Stanley Lane Poole.

Strat'ford-on-Avon, a town in Warwickshire, England, twenty-two miles southeast of Birmingham, celebrated as the birthplace of Shakespeare. It stands on the Avon river. "Shakespeare's house," where the poet was born, is on Henley street, and belongs to the government, having been bought for $15,000 and restored. The old guild hall was restored in 1892, and is occupied by the grammar school of King Edward VI., where Shakespeare was educated. The old church, with Shakespeare's and Anne Hathaway's graves, contains also an American stained glass window representing the "Seven Ages." The Shakespeare fountain was presented by an American, George W. Childs, in 1887; and the Shakespeare memorial theatre was built in 1877–79. Anne Hathaway's cottage, near by, also belongs to the nation. Stratford-on-Avon is an important agricultural center, but its prosperity depends largely on the Shakespeare visitors, who number 20,000 or more every year. Population 8,318. See *Sketch Book*, by Irving; *Our Old Home*, by Hawthorne; *Statford-on-Avon*, by Lee.

Strathco'na and Mount Royal, Lord, formerly known as Sir Donald A. Smith, high commissioner for Canada at London, was born in Scotland in 1820. He early in life entered the service of the Hudson Bay company, and was the last resident governor of that fur-trading corporation. For a time he represented Selkirk, Manitoba, in the Dominion parliament and was a director of the Canadian Pacific Railroad company. In the Boer war, he raised the "Strathcona Horse" for service in South Africa, equipping 500 men at his own expense. He is known for his active philanthropy.

Strauss (*strous*), **David Friedrich**, a German writer, was born at Würtemberg, Jan. 27, 1808. He began life as a country pastor, but after a year became professor in a seminary, and then went to Berlin for study. While teaching and lecturing at Tübingen, he published, in 1835, his *Life of Jesus*, which made a great excitement throughout Germany, and resulted in his dis-

missal from his position at Tübingen. His next publications were defenses of his work, which were followed by his second great work, *Christian Doctrine of Belief*. He published lives of Schubart and Ulrich von Hütten, and some brilliant lectures on Voltaire, and in 1864 a new *Life of Jesus*. *The Christ of Faith* and *The Old and the New Faith* are his latest works. His style of writing places him very high among German writers. He died Feb. 8, 1874. See *Life*, by Zeller.

Strauss, Johann, Austrian dance-music composer and conductor, known familiarly as "The Waltz King," was born at Vienna, Oct. 25, 1825, and died there June 3, 1899. He came of an eminently musical family, his father being a noted musician, while two of his brothers were composers of dance music. On his father's death, he became conductor, and toured the world with his own and his late father's orchestra. At the same time, from an early age, he composed waltses and operettas, which have held the stage with great favor. In 1872, he conducted an orchestra of 1,000 performers at the Boston Peace Jubilee; he was for a time also musical director to the Emperor Joseph at Vienna. His most famous waltz pieces are *Wiener Blut*, *Künstlerleben*, and *An der schönen blauen Donau*. Of his operettas, the following are best known: *Indigo Cagliostra*, *La Tsigane*, *Die Fledermaus* ("The Bat"), *Der lustige Krieg* ("The Merry War"), *Simplicius*, *Eine Nacht in Venedig*, and *The Gypsy Baron*.

Straw is the stem of grasses, such as wheat, oats, and barley. It is used on farms for feeding animals and as bedding for them. Its chief use in the arts is in the making of paper and hats. Wheat straw is most used for plaiting, the process by which the straw is prepared for hats, bonnets, and baskets. The straw is usually split into strips and plaited or braided by women and children. They are sold by the "score," or twenty yards in a piece. The finest straw plaits are made in Tuscany, and are made from whole wheat. The wheat is sown very thickly and the crop pulled up and cut off by hand for threshing. The plaiting of the finer straws is so trying to the eyes, that the plaiters cannot work more than two hours a day. Large quantities of straw plait are also sent out from Canton, China. The straw braids which are brought to this country are made into hats and bonnets by a machine which sews a hundred of them a day, and are pressed by another machine at the rate of four a minute. The Panama hats are made from straw from the leaves of a palm tree, and are braided by the Indians in South America.

Straw'berry, species of *Fragaria*, a genus of the rose family. It contains about twelve species, which are found in the temperate regions of the northern and southern hemispheres. The fruit is really a much enlarged and fleshy receptacle, in the surface of which the very small seed-like akenes are more or less imbedded. The strawberry is comparatively recent in cultivation, and in America it is said to be the most important of the small fruits. The ordinary commercial varieties are all from the Chilian strawberry (*F. Chiloensis*), whose name indicates its origin. The common wild strawberry of the eastern United States was once extensively cultivated, but it has about passed into disuse.

Streat'or, Ill., a city of La Salle county, on the Vermillion river, the center of a productive agricultural and coal-mining district, 92 miles southwest of Chicago. It is served by a number of railroads, including the Chicago and Alton, the Wabash, the Chicago, Burlington, and Quincy, and the Atchison, Topeka, and Santa Fé railroads. Its industrial establishments embrace foundries and machine shops; flour and planing mills; brick, tile, and sewer-pipe works; and manufactories of flint and Bohemian ware, window, and rolled plate glass, etc. The city has a number of fine churches, schools, banks, libraries, an opera house, and other civic institutions. Population 14,079.

Strength of Mate'rials, the resistance which materials offer to changes in form, such as elongations, compression, bending, and twisting. Such changes in form are called "strains," and the force with which the material resists a strain is called a "stress." In the use of materials for a structure or a machine, it is all important to the designer to know how much strain a given force will produce, whether the material will recover from the strain when the straining force is removed, and how great the strain can be before breaking takes place. A structure must be designed so as to withstand without permanent set the loads that it is to carry. In most cases it is equally important to determine what is the least amount of material which can be safely used under the given conditions. Experiments to determine these facts cannot be made on the completed structure, for while tests of complete structures are important, they cannot reveal all that is necessary to know, and besides would be an expensive way of determining safety limits. But by analysis of the forces and loads, the designer can reduce even in complex structures, such as bridges and roofs, the forces to comparatively simple straining actions in the individual parts, so that he can make his plans from the results of experiments on the materials used. Such experiments are called tests of strength of materials, and the machines for making the tests are called testing machines. (See TESTING MACHINES.) The behavior of materials under loads is that, under any load, there is a strain (elongation, compression, bending, twisting, etc.), and there is developed at the same time a stress resisting force which tends

to restore the material to its original form. In 1676, Robert Hooke first stated his law that in elastic materials the stress is proportional to the strain, a law which is assumed to be strictly true for structural testing. The ratio between the stress and the strain is called the "coefficient of elasticity." For practical purposes there are as many kinds of coefficients as there are kinds of strain, as coefficient of tension, of compression, of bending, and of torsion. As long as Hooke's law holds, the material regains its original form as soon as the straining force is removed. But if the strain goes beyond a certain amount, depending on the material, the material remains permanently deformed or "set," and we say it has been strained beyond "the elastic limit." In engineering work it is very important that no part of a structure or machine shall be strained beyond the elastic limit. If the load be still further increased the material will break under the load, and we have the breaking force or "ultimate strength of the material." From the above it is seen that the important tests which are commonly required are, (1) amount of elongation, of compression, of bending, and of torsion produced by different forces, (2) elastic limit in each case, (3) the ultimate strength or breaking force in each case. Stresses and straining forces are in British and American engineering practice stated in pounds per square inch. We can thus express the average tensile strength of timber as 10,000, of cast iron as 20,000, of wrought iron as 60,000, and steel 100,000 or over, meaning so many pounds per square inch cross section. The strength of any material depends on not only the composition of the material, but also on its physical condition, the treatment which it has undergone, the way the load has been applied, etc., and in every case a wide margin must be allowed between the possible loads as shown by the tests and the actual loads, and to allow for conditions which cannot be fully taken into account. The term "factor of safety" is used to express this relation between working loads and theoretically possible loads. Thus for a working tensile strain, one-fifth of the ultimate strength may be used for good wrought iron or the "factor of safety" is five. Besides the tension, compression, bending, and torsion tests, there are a number of other tests which are made on materials for special purposes, as tests on paving bricks for hardness and durability, tests of cements and limes. For detailed information on the strength of materials and testing, see Unwin's *Materials of Construction*, or Merriman's *Mechanics of Materials*.

Strobilus (*strō-bī'lus*) (in plants), a name given to the cone-like cluster of sporophylls which is best displayed by equisetums, club mosses, and gymnosperms. In gymnosperms it is often called a "flower," and it really stands for the flower in plants without floral leaves. It is probably the structure from which true flowers have been derived.

Strych'nine. See POISONS.

Stu'art or **Stew'art,** the name of a royal family of Scotland and England. The name is derived from the office of steward of Scotland, which was given to one of the family by David I., king of Scotland, and became hereditary in the family. The family is of Norman origin, the first ancestor in England receiving lands from Henry I. The marriage of Walter, the sixth steward of Scotland, in 1315, to Marjory, daughter of Robert Bruce, brought the crown of Scotland to the Stuarts. "It came with ane lass," said James V. Robert II., the son of Walter Stewart and Marjory Bruce, came to the throne in 1371 as the first of the Stuart kings. Between 1371 and 1714, fourteen Stuarts sat upon the Scottish and six of these also on the English throne. The last Stuart sovereign was Queen Anne. The house of Hanover, to which the present ruling family of England belongs, is connected with the Stuart family, through Sophia, electress of Hanover, who was the granddaughter of James I. See *The Royal House of Stuart*, by Gibb and Skelton.

Stu'art, Gilbert Charles, an American painter, was born at Narragansett, R. I., in 1755. He studied at Edinburgh, worked his passage home, and began painting at Newport, R. I. He returned to London in 1775, where he suffered from poverty until befriended by Benjamin West. He gained a high rank as a portrait painter, rivaling Reynolds and other English artists. In 1792, he returned to America, and painted the well-known portrait of Washington, and also those of Jefferson, Madison, and John Adams. He died at Boston, July 27, 1828. See *Life*, by Mason.

Stu'art, James Ewell Brown, a noted Confederate cavalry general, was born in Patrick county, Va., Feb. 6, 1833, and died from mortal wounds at Richmond, Va., May 12, 1864. His early career was spent as a mounted rifleman in Texas and Kansas, engaged in Indian warfare. When the Civil war broke out, he held a captaincy in the Union army, but resigned this to enter the Confederate service, in which he became the most distinguished of cavalry officers in the army of Northern Virginia.

GEN. J. E. B. STUART.

He took part in the battles of Bull Run, Antietam, and Fredericksburg, and conducted raids through the Shenandoah valley and into Pennsylvania. Being promoted to the rank of major-general, he was assigned to the command of the cavalry in Lee's army, and did good service for the South in the battles of the Wilderness. He covered the retreat after the battle of Gettysburg, and was mortally wounded at the battle of Yellow Tavern, in contact with the forces under Gen. Philip H. Sheridan. See McClellan's *Life and Campaigns of Major-General J. E. B. Stuart.*

Stu'art, Moses, an American clergyman and writer, was born at Wilton, Conn., in 1780. He studied at Yale, and became pastor of the Congregational church in New Haven, in 1806. From 1810 to 1848 he was professor of sacred literature at Andover Theological seminary. He published two Hebrew grammars, several commentaries, *Hints on the Interpretation of Prophecy*, and *Conscience and the Constitution.* He died Jan. 4, 1852.

Stubbs, William, an English historian, was born at Knaresborough, England, June 21, 1825. He studied at Oxford, and became a clergyman, settling at Navestock, in Essex, in 1850. In 1866, he was appointed professor of modern history at Oxford. He was made bishop of Chester in 1884, and changed to the see of Oxford in 1889. His writings are historical, and are marked by great learning and rare impartiality, and hold the highest rank in English history. He has edited a large number of ancient histories and chronicles, such as *Gesta of Henry II. and Richard I.; Memorials of St. Dunstan*, and *Chronicles of the Reigns of Edward I. and Edward II.* His historical works include *Constitutional History of England, The Early Plantagenets*, in "Epochs of Modern History," and *Seventeen Lectures on the Study of Mediæval and Modern History.* He died April 22, 1901.

Sturgeon (*stûr'jŭn*), a large fish of both salt and fresh water, having an elongated body and the skin provided with five rows of large bony plates. There are about twenty species, all living in the northern hemisphere. The skeleton and skull are cartilage, and the bony plates, which are formed in the skin, cover the head. Between the larger plates are smaller ones. The snout is elongated, the mouth, upon the under side, is tube-like and without teeth. In front of it hang four barbels. Its food is plants and small fish, which are sucked into the mouth. The common sturgeon is found on both sides of the Atlantic and ascends rivers to spawn. It reaches a length of eight to twelve feet on the Atlantic coast, and is larger in European seas. It ascends the Hudson to Albany, and its red flesh is jocularly called "Albany beef." The shovel-nosed sturgeon and the lake sturgeon, are common in the great lakes and waters of the Mississippi valley. They do not enter the sea. A sturgeon of the Pacific coast reaches a weight of 600 pounds, but the largest of all inhabit rivers flowing into the Caspian

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and Black seas. They are known as Hurso, and reach a length of twenty-five feet and a weight of nearly 3,000 pounds. The sturgeon's air bladder is the principal source of isinglass and the roe of caviar.

Stuttgart (*stŏt'gart*), a city of Germany, is the capital of Würtemberg. It is about two miles from the Neckar river and 127 miles southeast of Frankfort, and is surrounded by hills, which are covered with vineyards, gardens, and beautiful houses. Near the Palace Square, in the center of the city, is the old castle, belonging to the 16th century, the new palace, the theatre, academy, the jubilee column (1841), a statue of Schiller, and the railroad station, which is one of the finest in Germany. There is a famous polytechnic school, a conservatory of music, a museum and art gallery, and the royal library of over 500,000 volumes, including a fine collection of 7,000 Bibles. Stuttgart has one of the largest book trades in Germany, and manufactures beer, pianos, chemicals, chocolate, and furniture. Its fairs for the sale of books, hops, cloth, and horses are celebrated. It has been the capital of Würtemburg since 1842. Population 176,318.

Stuyvesant (*stī've-sant*), **Peter,** the last Dutch governor of New York, was born in Holland in 1602. He was in the army in the West Indies, became governor of Curaçoa, and lost a leg in the attack on St. Martin. He was made director-general of the New Netherlands, as the country was then called, in 1646. He was conciliatory toward the Indians, and just toward his subjects; but when a convention demanded that "no new laws should be enacted but with the consent of the people," Stuyvesant commanded the separation of the assembly, saying, "We derive our authority from God and the company, and not from a few ignorant subjects." In 1650, he helped to decide the boundaries between

the Dutch and English possessions, and in 1655 took the region around the Delaware from the Swedish settlers. When the English war ships, in 1664, appeared before New Amsterdam (New York), he was obliged to yield to the will of the people, and surrendered the city, the treaty being signed Sept. 4, 1664, in Stuyvesant's house on his farm, known as the "Great Bowerie," from which the Bowery in New York received its name. He lived eighteen years after the surrender on his farm, where he died August, 1682. See *History of New York*, by Martha J. Lamb, and *Knickerbocker's History of New York*, by Washington Irving.

Style (in plants), that part of a carpel which rises from the ovary as a more or less elongated beak, and bears the stigma. It relates the stigma properly to pollination. It is usually a slender cylindrical body, but it is often much modified in form, as in the common iris or flag, in which it resembles a small petal. In case the style is lacking, the stigma is said to be "sessile" on the ovary. See FLOWER.

(*a*) Style.
(*b*) Stigma.

Stylites (*stī'lī'tēz*), **Simeon,** a member of a class of hermits who spent their lives on pillars (Greek *styletes*). He was the founder of the order, and lived in the beginning of the 5th century. He was a Syrian monk and spent nine years in a monastery without stirring from his cell. Then, in his desire for holiness, he ascended a pillar near Antioch, where he spent 30 years. The pillar was 72 feet high and only four feet square on the top. His fame brought crowds of pilgrims, to whom he preached, making many converts from the pagan churches. He died on his pillar in 459, when seventy-two years old, and was buried with great pomp at Antioch. Other monks followed his example down to the 12th century.

Styx (*stiks*), in Greek mythology, is one of the rivers of the lower world, around which it flows seven times. Charon ferries the souls of the dead over this stream. It is named from the nymph Styx, the daughter of Oceanus, who first came to the help of Zeus against the Titans.

Sub'marine' Nav'iga'tion. See TORPEDO.

Suck'er (in plants), a very strong-growing branch which arises in an unusual position, as from the older parts of trees and shrubs, often at the base, or in connection with wounds. The process known as "pollarding" is for the purpose of inducing the development of suckers by means of wounds. Suckers are often called "watersprouts."

Suck'er, the name given a number of freshwater fishes of North America, with thick, fleshy lips bordering a sucking mouth. There are about sixty species in the family, which embraces the buffalo fishes of the Mississippi valley, the common suckers, and the mullet or red horse. They feed on plants and small water animals. The common sucker, or white sucker, reaches a length of eighteen inches, and is very abundant in streams from Canada to Montana and Florida. They are eaten, but the flesh is rather tasteless and bony. The remora (which see), having a sucking disk on the back of the head, is also sometimes called a sucker, and the name is also applied to the hag and certain other fishes.

Sucre (*sō'krā*), a name for Chuquisaca, the capital of Bolivia, which see.

Sue (*sū*), **Marie Joseph Eugene,** a French writer, was born at Paris, Dec. 10, 1804. He practiced surgery for some years in the army, in Spain and at Navarino, using his experience in his novels. The *Mysteries of Paris*, a famous novel, was his first success. It was printed in ten volumes in 1842, and appeared first in the columns of the *Journal of Debates*. *The Wandering Jew*, with which Sue's name is most associated, was also printed first in a newspaper, and issued afterward in ten volumes. He wrote later the *Seven Capital Sins* and *Mysteries of the People*. The last work was condemned by the court at Paris as immoral and seditious. In 1850, he was elected a deputy to the assembly, but went into exile after the accession of Napoleon III. and died in Savoy, Aug. 3, 1857.

Suez (*sō-ez'*) **Canal,** a passage connecting the Mediterranean and Red seas, was begun

in April, 1859, under the French engineer, De Lesseps. Half the money for the great work was raised by subscription in Europe, and the other half by the khedive of Egypt. The

canal was finished in 1869. It cost about $100,000,000, and is 87 miles long and originally from 150 to 300 feet wide at the top, and 26 feet deep. In 1886, it was widened and deepened. The highest point cut through is not more than 50 feet above the ocean. "Sidings" or side basins, to allow vessels to pass each other, are built every five or six miles. Since 1887 the canal has been lighted by electric light. It costs a vessel about $500 to make the passage, and takes a little over twenty-four hours. In 1899, 3,607 vessels passed through the canal, and the number of passengers, military and civilians, was 221,347.

Suffren', Pierre Andre de, a French naval hero, was born at Saint-Cannat, France, July 17, 1726. He entered the navy when only fourteen, was captured in the bay of Biscay, but soon released, and served six years with the Knights of Malta. Returning to the French service he was in the action of Minorca (1756), and was taken prisoner in the destruction of the Toulon fleet in 1759. From 1767, he served four years in the service of Malta, entering the French navy again in 1772. He was with the fleet blockading Gibraltar, and in command of five ships sailed to Madras, where he was in two or three battles, and conquered Trincomalee (1782). He was made vice-admiral of France on his return to Paris, where he was received with the greatest honors. He is called "one of the most dangerous enemies the English fleet has ever known, and, without exception, the most illustrious officer that has ever held command in the French navy." He died at Paris, Dec. 8, 1788. See *Studies in Naval History*, by Laughton.

Sugar, the name of a great number of substances which have a certain chemical composition and are soluble in water. The sugar of commerce, however, is chiefly derived from sugar cane and sugar beet, the latter supplying nearly two-thirds of the sugar used by the world. In these and other plants the sugar is an essential food, and is manufactured out of raw materials by green plants. The sugar cane (*Saccharum officinarum*) is thought to have originated in India, but it is not known wild. In the United States, sugar cane is most extensively cultivated in Louisiana, but it is also an important industry in Florida and Texas, and is cultivated to some extent in Mississippi, Alabama, and Georgia. Cuba and the Hawaiian islands are also great centers of the sugar-cane industry. The sugar-beet (*Beta vulgaris*) came from Burgundy, and is extensively cultivated in Europe. In the United States, the sugar-beet industry is comparatively recent, and is most largely developed in California. Maple sugar is a sugar of minor commercial importance, the maple chiefly used being *A. saccharinum*. The principal centers of this industry are Vermont, New York, and Ohio.

Su'liotes, a mixed race who inhabited the valley of the ancient Acheron in what is now European Turkey. They were of Greek and Albanian origin, and were descended from a number of families who fled from Turkish oppression to the mountains of Suli, whence their name. For several years they resisted the Turks, but, vanquished at last, took refuge in the Ionian islands. Though they helped in the war of Greek independence under their brave leader, Marco Bozzaris, their country was not included within Greek boundaries, by the treaty of 1829, nor by the extension to that treaty of 1881, but most of them established themselves in that country. See *History of Suli and Parga*, by Perhaebos.

Sul'la, Lucius Cornelius, a Roman dictator, was born in 138 B. C. As questor in 107, under Marius, in Africa, he induced the Mauritian king to surrender Jugurtha, whom he brought in chains to the Roman camp. He was in the war against the Cimbri, and in Cilicia, where he was sent by the senate to restore the king to his throne. On his return to Italy, in 91, the rivalry between him and Marius threatened to break out openly, but was checked for a time by the social war, in which Sulla won a brilliant success. He was given command in the second war against Mithridates, but Marius affected his expulsion from Rome, only to be in his turn driven out by Sulla. The four years he spent in the east were years of great success, in which he took Athens and won the victory of Chæronea. He crossed the Hellespont, forced Mithridates to ask for peace, landed at Brundusium and fought before the gates of Rome the great battle with the Samnites in which 50,000 men fell on each side. Sulla was now master of Rome and Italy. His dictatorship was marked by the cruel murder of his enemies. He published a list of proscribed persons whom any one might kill and in this way got rid of his enemies, to the number of nearly three thousand. He made some changes in the government of Rome, mainly in the direction of strengthening the senate, and taking the power from the people. He spent his last years at Puteoli in dissipation, bearing the marks of it in his blotched face, compared by the Greeks to a mulberry sprinkled with meal. He died in 78 B. C., at the age of sixty. The inscription on his monument, said to have been composed by himself, asserts that none of his friends ever did him a kindness, or none of his foes a wrong, without being well repaid.

Sul'livan, Sir Arthur Seymour, an English composer, was born at London, May 13, 1842. He studied at Leipsic. He wrote *Kenilworth*, a cantata; the overtures *In Memoriam* and *Marmion*, and the oratorios, *The Prodigal Son*, *Light of the World*, *Martyr of Antioch*, and *The Golden Legend*. He is best known by his hymn tunes, (by *The*

Lost Chord especially) and by his songs, and burlesque operas. The operas were written in connection with W. S. Gilbert and were very popular, especially *H. M. S. Pinafore*, which ran for 700 nights, and *The Mikado*. Later he wrote the opera *Ivanhoe*. He received many honors, and in 1883 was knighted. He died Nov. 22, 1900.

SIR ARTHUR SULLIVAN.

Sulphur (*sŭl'fŭr*), one of the non-metallic elements. It is found very widely distributed in the mineral kingdom, partly free, partly in combination with other elements. It is usually abundant in volcanic districts, large quantities coming from Sicily. It is found in many parts of the United States, but cannot compete with that from Sicily. The free sulphur is found mixed with earthy matter or pure in the shape of crystals. In combination it is found combined with iron and copper as iron and copper pyrites; with lead in galena; with zinc in blende. It is also found in the form of sulphates, as the sulphates of lime and magnesia. In vegetables, it exists in the proteids or albuminoids of seeds, etc., in the oils of mustard, garlic, and asafœtida, and in the juices of some plants. In animals, it is found in the tissues, the hair, saliva, etc. Sulphur is a solid, brittle, yellow substance, without taste or smell, and will not dissolve in water. When heated it forms a thin yellow liquid, and heated to the boiling point, it forms a yellow vapor. This vapor condenses into a fine yellow powder, called "flowers of sulphur." When it is melted it is poured into moulds, which makes the common roll sulphur, or brimstone. When heated in the air it takes fire, burning with a blue flame, and changes into sulphurous acid, with suffocating fumes. Sulphur is used in making matches and gunpowder, and as sulphurous acid, in bleaching and in the destruction of insects, and the germs of disease, and also in the manufacture of sulphuric acid, or oil of vitrol, which is a compound of sulphur, oxygen, and hydrogen. Large quantities of the acid are used in preparing sodium sulphate from common salt, as a preliminary step in one of the processes for making soda.

Su'mac, species of the genus *Rhus*, which contains over 100 species, chiefly tropical. In the United States there are about ten species, some of them well-known shrubs or small trees, with leaves which show bright red to purple autumn coloration. The common poison oak or poison ivy (*R. Toxicodendron*) is a sumac whose foliage is very poisonous. The most common form is *R. glabra*, or "smooth sumac," a shrub which often covers large and especially barren areas, with large compound leaves, and dense crimson velvety clusters of fruit.

Suma'tra (*sō-mä'trä*), one of the largest islands of the Indian archipelago, lies on the equator. It is 1,115 miles long and 275 miles broad, and is a dependency of the Netherlands. The Chain mountains in several ranges, from 7,000 to 10,000 feet high, cross the island, with seven or eight active volcanoes, and a number of mountain lakes. There are large rivers on the western side of the island, and the forests are so thick that it is said an ape can travel across the island from tree to tree without once descending to the ground. A Dutch expedition in 1877, exploring only a small part of the western side, collected 400 varieties of timber. The animals of the eastern side are entirely different from those on the western side. The orang-outang and the bru are the most common apes. The bru is employed by the natives to gather their cocoanuts. The tiger, the Malay bear, the hog, the two-horned Sumatran rhinoceros, and the elephant are among the best-known animals. The python, from 15 to 20 feet long, the cobra, and the crocodile are all found on the island; and 250 species of spiders have been discovered since 1858. Gold and coal are mined; rice, sugar, coffee, pepper, cocoanut, sago, corn, and sweet potatoes are cultivated. The people are of different tribes of the Malay family. The island became known in 1508 to Europeans, through a Portuguese explorer, and Portuguese trading stations were formed on the coasts. The Dutch drove out the Portuguese, but did not completely occupy the coast until 1881, and large parts of the interior are still unexplored. The population of Sumatra is 2,334,090. In 1832, what is known as the "culture system" originated in Java and spread to the western coast of Sumatra. This meant the officially superintended work of the natives in the culture of various products; but, in 1870, this system was abolished, and native labor is now only required for the production of coffee. The Europeans and those connected with them live under the laws of the mother country, while there are separate laws for the natives. Schools are provided for Europeans, natives, and orientals. See *Indian Archipelago*, by Wallace.

Sum'ner, Charles, an American statesman, was born at Boston, Mass., Jan. 6, 1811. He studied at Harvard and adopted the profession of law. He edited a law journal, the *American Jurist*, and three volumes of law decisions, chiefly those of Judge Story, and lectured in the law school at Harvard. He carried his law studies on farther in Europe at the Sorbonne, and spent two or three years in traveling, receiving marked attention when

in England. His appearance in politics dates from July 4, 1845, when he delivered his oration on *The True Grandeur of Nations*, which denounced the use of war to de-

CHARLES SUMNER.

cide national questions, and attracted general attention in both America and Europe. He succeeded Daniel Webster in the senate of the United States in 1850, and retained his position through successive re-elections until his death. He helped to form the Free Soil party, and stood almost alone in the senate at that time in his opposition to slavery. His strong, uncompromising attacks upon slavery were bitterly resented by the southern members of the senate. This hostile feeling resulted in an attack upon Sumner while sitting at his desk in the senate chamber, from the effects of which he suffered for nearly four years. His speech on *The Barbarism of Slavery*, delivered in June, 1860, was occasioned by the struggle over the admission of Kansas as a free state. As chairman of the committee on foreign relations, in March, 1861, he argued against the seizure of the southern commissioners in the Trent affair, made a powerful speech on *Our Foreign Relations*, and one on *Our Claims against England*. He was selected in April, 1865, to deliver the eulogy on Lincoln. His opposition to the treaty with San Domingo, in 1869, brought him into difficulty with President Grant, and ended in his supporting Greeley for the presidency in 1872. Among his last important measures were the introducing of the civil rights bill and the resolution to remove the names of battles from the colors of the army. His publications are made up of his public addresses, and fill fifteen volumes, prepared for the press partly by himself and partly by his literary executor, Longfellow. See *Memoirs and Letters*, by Pierce; *Life*, by Lester. He died at Washington, D. C., March 11, 1874.

Sun, The, our nearest star and the central body of the solar system. For the inhabitants of the earth, no other body in the heavens compares for an instant with the sun in point of interest and vital importance. For not only are the orbits of the earth and the other planets determined by the sun, but all forms of life on the earth are immediately dependent upon the heat and light which we derive from the sun.

The distance of the sun from the earth is nearly ninety-three million (92,897,000) miles, a stretch which baffles the imagination. Professor Young illustrates this quantity by saying that if a child were provided with an arm long enough to reach the sun and thus burn his hand, he would die of old age before he learned that he was burnt, assuming, as Helmholtz found, that sensations travel along the nerves at the rate of about 40 feet per second. Even light itself, traveling with the stupendous speed of 186,000 miles per second, requires 499 seconds for the trip from the sun to the earth.

The diameter of the sun is approximately 866,500 miles, a distance nearly twice as great as the diameter of the moon's orbit, while the mass of the sun is 1,332,000 times that of the earth, making its density about 1¼ times that of water, and the attraction of gravitation at the surface of the sun 27 times as great as at the surface of the earth. The weight of an ordinary man at the solar surface would, therefore, be such that he could not stand erect with his present strength of muscles.

The period of rotation of the sun was first determined after Galileo had discovered spots on the solar surface; and this rotation takes place in a very remarkable manner, for Carrington found that at the sun's equator spots travel once around the sun in 25 days, while at latitude 30°, the period is 26½ days, and at latitude 40° is no less than 27 days. Hence the sun rotates most rapidly near the equator and diminishes constantly in angular speed as one approaches the poles. This fact has never been satisfactorily explained.

As to the constitution of the sun and as to the nature of sun spots there are almost as many "theories" as there are men. What is reasonably certain, however, is that practically all of the elements which have been found in the earth's crust are to be found in the sun, making it highly probable that at some time the earth has been split off from the sun in the manner suggested by the nebular hypothesis. Concerning the interior of the sun practically nothing is known; for its temperature is outside the range of our experiments. The white surface of the central body of the sun is called the *photosphere*. The spectroscope shows that this photosphere is surrounded by a layer of incandescent gases which we call the *chromosphere*. Certain parts of this chromosphere appear at times to be heaped up into brilliant clouds thousands, and even hundreds of thousands, of miles high; these are called *prominences*.

Beyond the prominences and the chromosphere is a halo of light seen only at times of

eclipse. It is called the *corona;* but beyond the mere fact that it is an appendage of the sun little is known about it. The fact, however, that its spectrum contains bright lines would seem to indicate that it consists partly, at least, of a self-luminous gas.

The best account of solar phenomena is to be found in Professor Young's delightful volume, *The Sun*, published in the "International Scientific" series.

Sun'day Schools are schools for religious instruction, meeting on Sunday. There were schools for religious instruction in connection with the Jewish synagogues, and also among the early Christians. Luther established such schools in Germany, and Knox in Scotland. But the credit of founding the modern system of Sunday schools belongs to Robert Raikes, who in 1780, when living in Gloucester, England, gathered the children from the streets on Sunday and hired teachers for them, at 25 cents a day. These schools opened at 8 A. M., lasted until the children went to church, and after the second service, began again, holding until 5:30 P. M. The children were taught their letters, reading, and the church catechism. The first Sunday school in London was started by Rowland Hill in 1784. There are now, it is estimated, 7,000,000 scholars in the Sunday schools of Great Britain. The first regular Sunday school in America is thought to be the one started by Bishop Asbury in Hanover, Va., in 1786, though there had been schools for instruction on Sunday at Roxbury and Plymouth, Mass., as early as 1674 and 1680. There were some years ago 7,000,000 children in the Sunday schools of the United States, held in the churches of all denominations, including Catholics and Quakers. The instruction is by voluntary, unpaid teachers, a plan adopted first by the Methodists in England. For many years a uniform series of Bible lessons has been used in the United States, and to some extent in Europe. In 1890, the number of teachers engaged in Sunday school work was estimated to be nearly 2,000,000, with almost 18,000,000 pupils.

Sun'derland, a seaport of Durham, England, is at the mouth of the Wear river, thirteen miles northeast of the city of Durham. Among the public buildings are the town hall, free library, museum, art gallery, winter garden, and Victoria hall, the scene of a terrible accident in 1883, in which 182 children were killed. There are over seventy churches, an infirmary, an orphan asylum, and several theatres and clubs. People's park contains a monument of Havelock. There are two iron bridges over the Wear, the older one built in 1793–96 and widened by Robert Stephenson in 1858–59. There are four large docks and five piers at the harbor. Coal and coke, bottles and glass, earthenware, lime, etc., are exported. Sunderland is noted for its iron shipbuilding yards, of which there are thirteen on the river. Iron, glass, chemicals, rope, paper, and lime are also manufactured. The famous Pemberton coal pit is three hundred and eighty-one fathoms deep, and some of the workings reach under the sea.

Sunderland is known to have been a town as early as 1311. It was a small place till the beginning of the 19th century, but since then, owing to the improvement of its harbor, and the growth of the Durham coal trade, it has grown fast. Population 147,398.

Sun'fish, a common name used to designate a number of different fishes. The freshwater sunfishes, of which there are about twenty-five species, are abundant in the Mississippi valley. They are bass-like fishes. The most common one is generally known as the pumpkin-seed. It reaches a length of eight inches and is of bright colors—greenish olive, with bluish sides spotted with orange, and the belly and lower fins orange tinted. It is very abundant in ponds, lakes, and streams of the east. In western rivers sunfishes rarely come south of the latitude of Chicago. The marine sunfish, or head-fish belongs to an entirely different family. There are three species inhabiting the open sea. They are large fishes, with a very short body, and look like huge fish-heads provided with fins. They reach a weight of seven or eight hundred pounds and a length of seven or eight feet. They are not good for food, but a healing oil is derived from their livers. Their habit of basking in the sun at the surface of the water gives them their name, while that of freshwater sunfishes is derived from their bright colors.

Sun'flower, species of *Helianthus*, a genus of the great composite family. There are many species native to the United States, but the best-known form is *H. annuus*, a common species in cultivation, distinguished by its great stature and very large heads. It is a native of the western plains. The seeds yield a drying oil nearly equal to that of linseed.

Supe'rior, a city of Wisconsin, is at the head of Lake Superior, on the St. Louis, Superior, and Allouez bays. It is the terminus of the Great Northern, the Northern Pacific, the Chicago, St. Paul, Minneapolis, and Omaha, and the Duluth, South Shore, and Atlantic (Canadian Pacific) railways. The city has thirteen miles of water front, with extensive ore, coal, grain, lumber, and merchandise docks, and its lake commerce amounts to over five million tons annually, as much as the marine business of Boston or New Orleans. Superior has a perfectly landlocked harbor, and is the natural outlet for all the country lying west of Lake Superior and extending as far as the Pacific. The city boasts of the largest dry dock on the Great Lakes, and a great shipbuilding plant, where originated the type of boat known as the whaleback. It is the distributing point of

the northwest for coal and oil. There are sixty churches, a state normal school, ten large ward schools, with over 6,000 pupils, two high schools, a business college, three parochial schools, three hospitals, a $50,000 Carnegie public library, two daily and six weekly newspapers, four banks, thirty-five miles of paved streets, complete sewerage system, electric light and gas plants, an excellent filtering system of water works, and twenty-six miles of electric street railway. The manufactures are chiefly flour, lumber, iron, furniture, barrels, bags, coke, and twine. The climate is crisp, dry, and beautiful, cool in summer and relatively mild in winter. The original settlement was made at the east end of the city in 1853, but from 1858 to 1882 the place was practically dead. In 1882, an attempt to build a city was made four miles east on St. Louis bay, which proved so successful that the two settlements were united in 1891 and incorporated as the city of Superior. The growth has been very rapid, the last census showing a gain of 160 per cent. Superior is now the second city in Wisconsin, having a population of 31,091. It is the county seat of Douglas county.

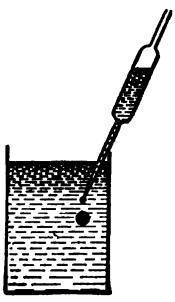
Supe'rior, Lake, the largest body of fresh water on the globe, is the highest and most western of the great lakes. It is bordered by Michigan, Wisconsin, Minnesota, and Ontario. Its greatest length is 412 miles; its greatest breadth, 167 miles, and it covers 31,200 square miles, making it a little larger than South Carolina. The surface of the lake is 601 $\frac{6}{10}$ feet above sea level, and its mean depth is about 475 feet, its greatest depth being 1,008 feet, or 406 feet below the sea. Its surface is 20$\frac{1}{2}$ feet higher than that of lakes Huron and Michigan, due to the fall at the rapids of St. Mary's river, the only outlet, where the average discharge is 86,000 cubic feet per second. Lake Superior is very near the watershed between Hudson bay and the Mississippi, and so receives no large rivers, the largest being the St. Louis and the Nipigon. These rivers, together with hundreds of small streams, drain into the lake 82,000 square miles. The largest island is Isle Royale, which is forty-four miles long. Keweenaw Point reaches far into the lake. At Grand Isle bay, about 100 miles west of Sault Ste. Marie, are the pictured rocks, sandstone cliffs from 50 to 200 feet high, in many places, of fantastic shape and marked by bands and blotches of red and yellow. The boundary line between the United States and Canada is drawn through the center of the lake from its outlet to the mouth of the Pigeon river, but includes Isle Royale in the United States. See Crossman's *Chart of the Great Lakes.*

Surabaya (*sö-rä-bï'ä*), a seaport on the north coast of Java and on the strait of Madura. Here the Dutch have a marine arsenal, a cannon foundry, and a mint. There are also machine, sugar, and furniture factories. Population 145,690, of whom 6,000 are Europeans and nearly 7,500 Chinese.

Surakarta (*sö-rä-kär'tä*), a city in the center of Java, but joined by rail with Samarang on the north and Surabaya on the east. It is the home of the native sultan of Surakarta, who is a dependent of the Dutch government. Population 124,000.

Surat (*sö-rät'*), a city of India, on the Tapti river, 160 miles north of Bombay. It stretches for more than a mile along the river in the form of a bow, and is surrounded by suburbs spread in the midst of gardens. There are four fine Mohammedan mosques, two Parsee fire temples, three Hindu temples, a clock tower 80 feet high, and the old citadel. Surat was founded in the 16th century, and was three times burned by the Portuguese. After the building of a strong fort in 1546, Surat became one of the greatest trading cities in India, the English and Dutch, as well as Portuguese, establishing themselves there. By the beginning of the 17th century, Surat had trading relations with western Europe, India, Arabia, Persia, Ceylon, and the East Indies. Here, too, the Mohammedan pilgrims embarked for Mecca. In this century it was pillaged several times by the Mahrattas, lost most of its trade to its new rival, Bombay, and in 1800 came into the hands of the British. It later regained some of its trade and became the largest city in India, but was ruined by a fire, followed by a great flood, in 1837. Surat exported large quantities of cotton during the American Civil war. Population 109,229.

Sur'face Ten'sion is a phenomenon exhibited when two liquids (or a liquid and a fluid) which do not mix are brought into contact. For instance, a drop of oil placed in a mixture of water and alcohol, which has the same density as the oil, will neither sink nor rise; but it will gather itself up into a sphere, *i. e.*, it will assume a shape in which it has the least possible surface. In other words, it acts as if it were covered with a thin elastic skin which was continually tending to contract to the least possible area.



A DROP OF OIL FREED FROM GRAVITY.

Another illustration of this phenomenon is seen when mercury is placed, in air, on glass, as indicated in the figure. The mercury does not flatten out and run all over the glass as it would do if gravitation alone were acting upon it; but it gathers itself up into a more or less spherical shape. This globule is exactly what we should expect if the mercury were covered

MERCURY ON GLASS.

with a thin elastic membrane tending, all the while, to contract into the smallest possible area. This tendency of liquid surfaces to become a minimum is known as *surface tension*. There is no skin or membrane over the surface of liquids; but the particles lying on the surface and very near the surface are in a different physical condition from the particles in the interior of the liquid; and hence this surface effect, the details of whose explanation would lead us too far.

The numerical value of the surface tension of any liquid is *the force per centimeter which a single surface exerts* across any line drawn upon it. The unit in which surface tension is measured is, therefore, *dynes per centimeter*. See C. V. Boys' *Soap Bubbles and the Forces which Mould Them* (Soc. for the Promotion of Christian Knowledge: London), the finest elementary and popular treatment in the English language.

Sur'rey, Henry Howard, Earl of, an early English poet, was born between 1516 and 1518, probably in Suffolk, and was the son of the duke of Norfolk. In 1532 he accompanied Henry VIII. to France, and spent a year in study at Paris with Henry's son, the duke of Richmond, who was betrothed to his only sister. In 1542 he was sent to Fleet prison for challenging a gentleman to a duel, and the next year suffered another imprisonment for breaking windows in the streets at night. In 1544 Surrey went to France as marshal of the invading army, and distinguished himself at the siege of Montreuil, where he was badly wounded. But the next year he was defeated by a larger French force, and was superseded by the earl of Hertford. For his bitter speeches against Hertford he was imprisoned, and later, with his father, sent to the Tower, charged with high treason. His only offense was in having added to his own arms those of his ancestor, Edward the Confessor. In vain did he ably defend himself at his trial; he was found guilty and was beheaded Jan. 21, 1547. His poems were published after his death, together with those of Wyatt. They are sonnets, lyrics, elegies, paraphrases of the Psalms and Ecclesiastes, and translations. He was the first English sonneteer and one of the best. See Morley's *English Literature*.

Surveying (*sûr-vā'ing*), a branch of applied mathematics devoted to measuring land. There are two great branches, plane surveying and geodesy. Plane surveying is used where such small areas are measured that the surface of the earth can be looked on as plane. Where large areas are measured, as states and countries, then the curvature of the earth must be taken into account and the science of land measurement becomes geodesy. Plane surveying is divided into branches, such as: land surveying, having to do with fixing property lines and areas of tracts of land; topographical surveying, having to do with levels, and general contours of the landscape; hydrographical surveying, having to do with areas and depths of rivers, lakes and other bodies of water; mining surveying, having to do with the direction and lengths of mining shafts and galleries; railroad surveying, etc. One of the most important geodetic surveys now going on is the U. S. Coast survey. It was started in 1832 by F. R. Hassler, and has now covered nearly the whole coast of the United States, the results being embodied in a sectional map on a scale of one mile to the inch. Eventually the whole country will be mapped out on this scale. Surveying and geodesy are applications of geometry and trigonometry, and involve the measurement of length and directions of lines. All plane surveying could be done by the measurement of lengths, but it is most convenient to measure angles also. The chief instruments are the chain or tape, the compass, level, and theodolite. In geodetic surveying, instruments for measuring latitude and longitude must also be used.

The survey of public lands of the United States is in charge of a surveyor-general. The land is divided into townships, each six miles square. The townships lying between two meridians six miles apart make a range. The townships are then divided into "sections," a mile square, these containing 640 acres. Land titles in the western states mostly refer to the original United States survey, and in this respect differ from the land titles in the older states, where boundaries and corners are fixed by various natural and artificial marks.

Susa (*sōsă*), a city of Persia, the same as the Shushan of Daniel and Esther, the modern Sus, and one of the most important cities of the Old World. Its name and its ground plan are traced on Assyrian monuments of the reign of Asur-banipal, about 600 B. C. At the time of Daniel's vision "at Shushan in the palace," it belonged to Babylon, but it was brought by Cyrus under Persian rule, and the later kings made it the capital and winter residence of the Persian empire, building there a strong citadel and a treasure house. Alexander is said to have found vast treasures here, and though Babylon soon became the chief city, it was still very rich when it fell into the hands of Antigonus (315 B. C.). Later, its fortifications were destroyed by the Arabs. Its ruins, among them the palace described in Esther, cover about three square miles.

Suspen'sor (in plants), an organ of the embryo, by means of which it is placed in proper relation to its food supply. It is mostly restricted to the embryos of seed-plants, and is usually a more or less filamentous structure, at the end of which the embryo proper develops. See EMBRYO.

Susquehan'na River, The, is formed by two branches, the north branch, 350 miles long, rises in Schuyler lake, in central New

York; the west branch, 250 miles long, rises in the Alleghany mountains. The two unite at Northumberland, Pa., and the river flows south to Harrisburg, southeast into Maryland, and after a course of 150 miles falls into the north end of Chesapeake bay. It is a shallow stream, much broken by rapids. In the spring immense quantities of lumber are floated down the Susquehanna. Canals have been dug along its banks for 125 miles along the north branch, and for 124 miles along the west branch. Its lower course is noted for ducks and other wild fowl. Its chief branch is the Juniata. The Susquehanna is also noted for its wild and picturesque scenery.

Suttee (*sŭt-tē'*), meaning "a virtuous wife," a once common usage of India, in accordance with which, on the death of her husband, the faithful widow burned herself on the funeral pyre along with her husband's body, or, if he died at a distance, was burned on a pyre of her own. The custom was practiced in India as early as the times of the Macedonian Greeks, and was grounded by the Hindus on various of their sacred books and laws. But it is now known that no countenance to this barbarous rite can be found in the oldest and most sacred Hindu books. Nevertheless suttee, though not enforced on an unwilling victim, and not practiced except in certain castes and families of old descent, was made almost necessary for well-born widows, by the force of public opinion, unless they were willing to risk their own happiness here and hereafter. The rite no doubt came from a belief, common to many savage races, that it was well to send wives, slaves, horses, favorite weapons, etc., along with great men into the other world, by burying them with them, burning them, or slaying them at their tomb. In 1823, about 900 widows were burned in India. In 1829, through the efforts of Lord William Bentinck, any encouragement of suttee was made murder. The custom is now rarely practiced.

Swabia (*swā'bĭ-a*), a southwest German duchy, stretching from Franconia to Helvetia and from Burgundy and Lorraine to Bavaria. It was so named from the Germanic Suevi, who drove out the Celts of this region in the 1st century B. C. The Alemanni became a part of the Suevi nation in the 5th century, and from this time there were dukes of Swabia. Under the Hohenstaufen emperors, who were Swabians, this duchy became the richest, most powerful, and most civilized country in Germany. But when the Swabian line of emperors died out, Swabia became the scene of feudal wars, and this unhappy state of affairs lasted for centuries. In particular Swabia suffered terribly in the Peasants' war of 1525, in the Thirty Years' war (1618–48), and in the wars of the French Revolution. From the time of the Reformation the rulers of Würtemberg struggled with the German emperors for the control of Swabia. This struggle ended in the founding, in 1806, of the kingdom of Würtemberg, which includes most of the old duchy. The name now denotes the south central part of Würtemberg, the adjoining part of Baden, and the southwestern part of Bavaria.

Swal'lows, insect-eating birds with long pointed wings, noteworthy for rapidity of flight. There are about one hundred species of swallows found in all parts of the world. Six of these are common in the United States. All of them devour an immense number of insects and are beneficial to the farmer. The common barn swallow is widely distributed and abundant. It is about seven inches long, with a long forked tail. The upper parts are steel blue, and the under parts buffy, with white spots on the tail and deep chestnut on the throat. Their nests are mud pockets usually placed on a beam in barns. The cliff, or eve swallow, is a square-tailed bird smaller than the foregoing, which builds numerous nests in colonies under the eves of barns, other buildings, and cliffs. The bank swallows are our smallest swallows, being about five inches long. They dig tunnels in sand banks two or three feet deep with a nest of grass and feathers at the end. The tree swallow has the under parts white. It nests in hollow trees, or in bird boxes near dwellings. The rough-winged swallow resembles the bank swallow. It is common in the west, making nests in sand banks. The purple martin is the largest of our swallows, being about eight inches in length. Swallows resemble the swifts, or chimney swallows, and goat suckers, but the latter birds belong to quite a different order. See MARTIN, SWIFT.

Swan, a name for a number of water birds, famous for their long graceful necks, and related to ducks and geese. They inhabit temperate regions and feed upon seeds, roots, and fish spawn. They have white plumage, except the black swan of Australia — a very beautiful bird with a long neck, having a graceful curve. It is a dull black, with white on the wings, and a carmine bill crossed by a white band. The European swan, partly domesticated in parks, has a long graceful neck. It is pure white and one of the most graceful of all animals. South America has a competitor for grace and beauty in the black-necked swan, a small swan with white plumage except the head and neck which are dark seal brown. The common swan reaches a length of about five feet and a weight of thirty pounds. The swans of North America are the trumpeter and whistler swans, with straighter necks and, therefore, less grace and beauty than other members of the group. They are smaller than the common swan.

Swansea (*swon'sē*), a seaport of Wales, on the Tawe river, forty-five miles northwest of Cardiff, is the most important city of South

Wales. Its growth is due to its tin plate manufacture, two-thirds of the British output being manufactured here. It is also the principal seat of copper smelting in Great Britain, perhaps in the world, and in its vicinity are extensive coal mines. It has large docks, covering sixty acres, a good harbor, and is several hours nearer the open sea than any other considerable port on Bristol channel. The McKinley tariff greatly injured Swansea's tin plate trade. The town charter dates from the days of King John. A tower is still standing of the castle built here by the earl of Warwick in 1099. Population 105,472.

Swe'den, the eastern portion of the Scandinavian peninsula, makes with Norway one kingdom. It is over 600 miles long; its greatest width is 200 miles, and it covers 172,876 square miles. In the northern parts the land rises from the gulf of Bothnia to the Kiölen mountains, which form the boundary line between Sweden and Norway, their highest peaks rising above the snow line. South of this region is the mountainous district made up of the great table-lands of Jemtland and the valleys of Herjedal and Ljungan, where there are good pasturage and timber lands. The mountainous region further south, from Lake Siljan to Lake Wener, is the mining part of Sweden, and includes the noted iron mines of Danemora, and the copper works of Fahlun. Lakes Wener, Mälar, and Hielmar almost cut the country from east to west, and with Lake Wetter make up a large lake district, which is the commencement of the most fertile part of Sweden, the lower end of the peninsula between the Cattegat and the Baltic. The lakes of Sweden cover one-eight of the surface; the largest is Lake Wener, the outlet of which to the Cattegat is the river Göta, noted for its picturesque rapids. The rivers are small and unimportant, the largest being the Angerman.

Summer and winter succeed each other with almost no spring or fall. Usually not enough grain is grown to supply the home market, though barley does better than oats or rye. Other crops are potatoes, hemp, flax, tobacco, and hops. Pine, fir, and beech trees are of great value for timber, tar, pitch, charcoal, and firewood. These trees mainly make up the great forests which cover more than a fourth of the surface. Bears and beavers are now scarce; but wolves, lynxes, martens, eagles, etc., are still common.

Copper, iron, alum, vitriol, marble, lead, sulphur, and a little coal, gold, and silver are found; mining is the most important business after farming. Iron and shipbuilding head the list of manufactures. Iron, timber, and copper are the chief exports; yarn, wool, leather, coal, and cotton the main imports.

The money unit is the rixdaler, worth about 29 cents. The national debt is $25,403,129. The three provinces of Sweden are Norrland, Svealand, and Gothland, but for purposes of government it is divided into 25 laens. After Stockholm, the capital, the largest city is Gottenburg (population 126,849). The Swedish permanent army of 39,123 men is in part quartered on the landowners, the soldiers working in time of peace as field laborers in return for their support; in time of war they are paid by the crown. Every Swede between the ages of twenty and twenty-five must serve in the national guard, and a reserve of 450,000 men is formed of conscripts between the ages of twenty-one and forty years. Sweden is a constitutional and hereditary monarchy, the succession being in the male line. The king has a council or cabinet of ten ministers. The diet meets every year; the upper house has 127 members chosen for nine years, who must have a certain amount of landed property, or income; the lower house has 188 members. A small property qualification is required in the voter, who must be a native having attained his majority.

The state church, to which the king must belong, is the Lutheran; but no civil disabilities attach to those not of the national religion. Education is compulsory, and there are free schools. The University of Upsala was founded in 1476, and has an attendance of 1,386 students; and the smaller University of Lund numbers 581 students. There are 107 public and private high schools, with 18,266 pupils, and 12 normal schools with 1,272 pupils.

In early times the Swedes lived in the north of Sweden and the Goths in the south. Eric Edmundson is said to have first conquered the whole of Sweden near the end of the 9th century. At this time Swedish history begins, and we find the Swedes generally at war with their Norwegian and Danish neighbors, and busily engaged in ravaging the eastern shores of the Baltic. In 1000 A. D., Olaf Schooszkönig was baptized a Christian, and the burning of the national temple at Upsala, in the reign of Ingiald (1080–1112), finished the overthrow of the old Pagan religion. The murder of King Eric in 1161 was the beginning of a disastrous period of civil wars, lasting 200 years. At length the nobles offered the throne to Margaret, queen of Denmark and Norway, thus uniting the three Scandinavian countries in 1347.

In 1523, Gustavus Vasa made Sweden again independent of Denmark, founded a long line of Swedish kings, of which he himself was one of the greatest, and raised half barbarous Sweden to an honorable place among civilized nations. In Vasa's reign, Protestantism was made the state religion. Gustavus Adolphus (1611–32), one of the greatest generals of his age, spent the greater part of his reign in wars with Poland and Russia, for the possession of Ingria, Livonia, and other Baltic districts, and in defending Protestantism in Germany. His affairs at home were ably managed by the wise Oxenstien, who, after

the death of Gustavus at the battle of Lützen, carried on the government during the minority of Christina. This strange queen's most popular act was her abdication. Charles XI. (1660–97) so greatly increased the kingly power that the diet acknowledged it to be absolute. The warlike career of the gifted but reckless king, Charles XII. (1697–1718), who humbled Frederick IV. of Denmark, and Peter the Great of Russia, and dethroned Augustus II. of Poland, nearly ruined his country. His sister Ulrica was chosen queen on condition of giving up the absolute power wielded by the last two kings. In the reign of Ulrica, the last of the Vasas, and her husband, Frederick of Hesse-Cassel, the country was divided into two factions of nobles — the "Hats," or French party, and the "Caps," or Russian party. Gustavus III. (1771–72), who recovered the lost power of the crown and put down these factions, was murdered. Charles XIII. (1809–18) was forced to cede Finland to Russia. Charles was childless, and chose Napoleon's general, Bernadotte, prince of Pontecorvo, as crown prince. Bernadotte's success in getting possession of Norway endeared him to the people, and he ascended the throne, in 1818, as Charles XIV. He ruled ably, and has been succeeded by his son Oscar I., and his grandsons Charles XV. and Oscar II., the present king. Population 5,097,402. See Fryxell's *History of Sweden* (English translation).

Swe'denborg, Eman'uel, was born at Stockholm, Sweden, Jan. 29, 1688, the son of a bishop, and of noble family. He was graduated at the University of Upsala, and, after four years of travel, was given a position in the College of Mines by Charles XII., who became his friend. For some years he busied himself in writing a host of scientific works, mainly practical, on bridges, air guns, docks, blood circulation, copper manufacturing, etc. Suddenly his scientific work stopped, and in 1749–56 appeared in twelve volumes a Latin work which he called *Heavenly Secrets*. He announced that the Lord had appeared to him, and had sent him to be the herald of a new church, and that his office was to interpret the Word of God according to its true meaning. *The New Jerusalem and Its Heavenly Doctrine* and many other theological works followed. Swedenborg made no effort to found a church, but confined himself to the work of announcing the new doctrines which were to be its basis. As a man he was modest and retiring, genial and happy, and lived a most simple and quiet life. He died at London, March 29, 1772. Since his death, religious societies have been founded on Swedenborg's teachings, and are banded together in America as the general convention, and in England as the general conference of the New Church. See *Life*, by Wilkinson.

Swift or **Chim'ney Swal'low,** a small bird abundant in the eastern United States, nesting in chimneys. Notwithstanding its common name, the bird is not a swallow, having only a superficial resemblance to the latter birds, while in structure it is very different. It is closely related to the humming birds and the goat-suckers. The bird is about five and one-fourth inches long, of sooty-brown color, with a paler throat. The feathers of the short tail end in sharp bristles, which aid in climbing. There is only one kind in the United States east of the Rocky mountains, but there are about fifty species inhabiting the warmer parts of the world. In most of them the salivary glands are highly developed, and the secretion from them is used as a glue to hold the nest together and to its support. In China one species constructs a nest that is used in making soup.

Swift, Jon'athan, was born at Dublin, Nov. 30, 1667, after his father's death, and was brought up in poverty, what little support he had being furnished by relatives. He spent seven years at Trinity college, Dublin, most of the time in disgrace with the authorities. He was then taken into the family of the politician and ex-minister, Sir William Temple. Four years later his pride drove him away from his patron's house, and he became a clergyman. But soon threw up the Irish living he had had for two years, and went back to Sir William's service, remaining there till his patron's death in 1699, and publishing an edition of Temple's works (1700–03). In 1704, appeared his first work, *A Tale of a Tub*, the wildest and wittiest satire of the 18th century. This work cost him a bishopric and forced him to be contented for life with the deanery of St. Patrick's, Dublin. In politics he was at first a Whig, but in 1710 he joined the Tories and became easily the most powerful pamphleteer in England, his *The Conduct of the Allies* being an English classic. The death of Queen Anne put the Tories out of power, and Swift retired to St. Patrick's. His famous *Drapier's Letters*, written in 1724 against the copper money which was to be supplied to Ireland by a certain Wood, who had bought the right from the English government, made him at one bound the most popular and most powerful man in all Ireland. A reward of $1,500 was offered for the name of the author, but no one of the many in the secret thought of betraying him. At last the scheme was given up. In 1726, Swift published his most popular work, *Gulliver's Travels*. Almost as great a masterpiece is *The Modest Proposal*, in which he suggests, in seeming cold blood, that in order to relieve their poverty and distress the Irish should sell their children as food for the rich. Swift died Oct. 19, 1745. See John Forster's *Life of Jonathan Swift*; and Thackeray's *English Humorists*.

Swim'ming. The weight of the human body is so little greater than that of water, that it can readily be floated, especially when,

as in swimming, it is forced through the water by the arms and legs. Benjamin Franklin suggested as a good way to learn to swim, to wade out breast deep, and tossing an egg into the water in the direction of the shore, to plunge after it; it will soon be discovered that it is easier to swim than to sink. In swimming on the breast, the stroke is made by vigorously kicking out the legs — previously bent up — and at the same time thrusting the arms straight ahead in the form of a wedge, then drawing up the legs for another stroke, while the arms are swept through the water in the form of a half circle. The stroke, is made most powerful by keeping the feet as widely apart as possible. Breast swimming is the easiest method and is always used for long distances. A faster way is to swim on the side; the under arm only being thrust forward, while the other is thrust downward and backward. In over-hand swimming each arm is thrown out of the water alternately, the swimmer at the same time turning from side to side; this is the fastest method. In swimming on the back the arms are not used at all. In treading water the swimmer stands upright and treads the water as if walking up a pair of stairs. In floating the swimmer lies on his back, keeping his face only out of the water. It is easier to swim in salt water than in fresh, as it is more buoyant. The Greek story of Leander's famous swim across the Hellespont was made probable by Lord Byron's performing the same feat in 1810. In 1875, an Englishman, Matthew Webb, swam 20 miles in 4 hours and 42 minutes, and the same year swam the English channel from Dover to Calais, the tide carrying him on a zigzag of about 50 miles, in 22 hours. A fourteen-year-old girl, Agnes Beckwith, swam five miles in 67 minutes.

Swinburne (*swin'burn*), **Algernon Charles,** an English poet, was born at London, April 5, 1837, the son of Admiral Swinburne. He was educated at Baliol college, Oxford, and spent some time in study in France. Two plays, *Queen Mother* and *Rosamond*, were his first writings, followed by his best-known poem, the tragedy, *Atalanta in Calydon*. His later poems are *The Armada*, and *An Autumn Vision*. Swinburne enjoys great popularity in America as well as in England, being especially remarkable for his facile metrical invention; and was for a time under consideration as successor to Tennyson in the English poet laureateship. His chief prose writings include *A Study of Shakespeare, A Study of Ben Jonson, A Study of Victor Hugo, Wm. Blake: a critical Essay, Essays and Studies*, and *Prose Miscellanies.*

ALGERNON C. SWINBURNE.

Swine are among the most important of food animals. For the wild boars, from which swine are probably descended, see BOAR. The word boar is now used of the male hog; the female is termed sow — the young are called pigs, and when half-grown, shoats. A sow has two litters a year of from eight to twelve pigs each, or even more; and it has been calculated that in ten generations the descendants of a single sow would number over 6,000,000. Pork is held to be unwholesome in warm countries, and the ancient Egyptians, as also the Jews and Mohammedans, did not use it.

The Neapolitan hog is the finest of the Italian breeds; it is black, with a short snout, and upright ears. The Berkshire English swine are both black and white, and make fine bacon and hams. One of the most valuable of English breeds is the Essex, a black hog, which is easily fattened, and at 12 to 18 months furnishes from 250 to 400 pounds of dressed meat. Suffolk swine, though small, put on a large amount of fat for the food they eat. Chinese swine are easily fattened, but are chiefly used to cross with English breeds. Pork packing is one of the great branches of business in the United States. Its leading centers are Chicago, Cincinnati, and Kansas City, in the order named. In 1890, the packing establishments put on the market 3,047,651,000 pounds of hog product, not counting hogs killed by farmers for their own use, or sold by them in towns and cities. This output was nearly three times that of 1873.

Swit'zerland, an inland country of Europe. Its greatest length from east to west is 180 miles, its greatest width from north to south, 130 miles, and its area 15,976 square miles. Switzerland is the most mountainous country on the globe. Its principal chains are the Alps and the Jura. The Alps run from east to west along the southern or Italian frontier, and their windings and spurs fill more than half the country. The mean height of the highest chain is from 8,000 to 9,000 feet. The Jura run northeast from the western corner of Switzerland, and are a series of parallel ridges shutting in long and narrow valleys; their mean height is not over 4,000 feet. In the angle formed between them and the Alps lies the plain of Switzerland, 1,400 feet above the sea, and 100 miles long by from 20 to 30 broad. To the east of this tableland is the Thur hill country, between lakes Zürich and Constance. The Jura, the plain, and the hill country are the main divisions of northern Switzerland. The Alpine region is divided into the valleys drained by the Rhône; those drained by the Ticino; the Grisons, valleys drained by the branches

of the Rhine and Danube; the Bernese Oberland, sloping toward the plain of Switzerland; and the Forest cantons, surrounding Lake Lucerne. Everywhere above 9,500 feet high the mountains are covered with everlasting snow, which descends along the hollows in glaciers to a much lower level, and in this way covers the higher parts of the country with a vast sea of ice. The lowest part of Switzerland is in the valley of the Rhine, between Constance and Basel, and the banks of lakes Zürich and Maggiore.

Good coal is not to be had, and the houses are mostly wooden, so that the forests, which cover one-sixth of the surface, are very valuable. The trees, cut on the heights and trimmed of their branches, are slid down the icy slopes to the valleys below and loaded on rafts. The chief business is that of the herdsmen and shepherds, who spend the summer with their cattle on the mountains, living in rude huts called châlets, and there the butter and cheese are made. The plain of Switzerland is a rich farming region; large quantities of grapes are grown at Vaud and Neuchâtel, and the orchards of the Thur country and Lake Constance furnish the Kirchwasser, the common drink of the people. In Switzerland, out of every 100 square miles 30 are filled with rocks, glaciers, and water; 17 with forests; 11 with plowed lands; 20 with meadows, and one with vineyards. The manufactures are chiefly confined to the northern cantons — silk in Zürich, Aargau, Glarus, and Basel; cotton in Zürich, St. Gall, Appenzell, Aargau, Glarus, and Neuchâtel; watchmaking in Geneva and Neuchâtel; straw plaiting in Aargau and Lucerne, etc. Though without a seaport, Switzerland's trade in proportion to population has long been greater than that of any European country, except England. The chief imports are wheat, salt, raw silk, and cotton; the chief exports are charcoal, cattle, silks, cottons, watches, and jewelry.

Each of the twenty-five cantons of Switzerland rules its home affairs, in some of the cantons by means of a representative assembly, in others by the Landesgemeinde or assembly of all the men in the canton. The federal legislature has two houses, the state council and the national council. The president of the republic, elected by the federal assembly for the term of one year, has little power, being merely one of the federal council of seven, which is chosen for three years. Almost every head of a family has his plot of ground, and there are no great estates or powerful landowners.

There is no standing army, but every citizen is obliged to serve as a soldier, so that the children are taught at school to bear arms, from the age of eight passing through annual exercises and reviews. In fifteen cantons the German language prevails; in five, the French; in one, the Italian; and in one, the Roumansch, a Latin dialect which still lingers in the Grisons. Basel, Bern, and Geneva are the centers of the Protestant part of Switzerland, while the Alpine region is almost wholly Catholic. Three years schooling is required for every child, and in every district there are both primary and secondary schools. There are many higher and specialized schools that are largely attended; and five universities situated at Basel, Bern, Zürich, Geneva, and Lausanne. Basel university dates back to 1460. The total attendance is 3,992. Switzerland has 1,505 post offices; 2,347 miles of railway, and a very complete system of telegraphs, which is almost wholly under state control. The chief towns are Zürich (population 150,239), Basel (population 112,842), Geneva (population 104,044), Bern (population 63,994), and Lausanne (population 56,000).

The first people of Switzerland were the Helvetii in the northwest, and the Ræthians in the southeast, both of which races were conquered by the Romans, and had parts of their territories settled by Burgundians, Alemanni, and Goths. From the 5th to the 7th century, Christianity was adopted. In the early part of the middle ages the country formed part of the German empire. In the 13th century civil wars broke out, during which many of the towns obtained special rights and charters. The attack of the emperor, Albert I., on the great towns caused the men of the Forest cantons in 1307 to begin a war against Austria, which gained them freedom in 1315. A league of eight cantons was formed in 1352, followed by other wars with Austria, ending with the famous Swiss victory of Sempach. In 1415, Aargau and Thurgau were conquered from Austria, and Ticino, beyond the Alps, was annexed three years later. In 1476, the battles of Granson and Morat (Murten) were won from Charles the Bold, and in 1499 the emperor, Maximilian, was defeated in six engagements.

Zürich, under the preaching of Zwingli, became a Protestant city in 1523, followed by Bern and other northern cantons. A religious war was waged against the Catholic Forest cantons, in which the Catholics were successful. In the treaty of Westphalia, at the end of the Thirty Years' war in 1648, the European states acknowledged the independence of Switzerland. The French seized Switzerland in 1798, but it recovered its freedom in 1814. Since that time the chief events have been local rebellions and other attempts of the people in the various cantons to get back powers which they had gradually lost to corporations and great families. In 1844, the radical party organized bodies of armed men, called the Free Corps, for the purpose of driving out the Jesuits. The Catholic cantons formed in their defense the league called the Sonderbund. After several town revolutions, a majority of the federal diet declared against the Jesuits and the Sonderbund, and waged a successful civil war against the Catholic cantons. The present constitution was chosen in 1874. Population 3,312,551. See

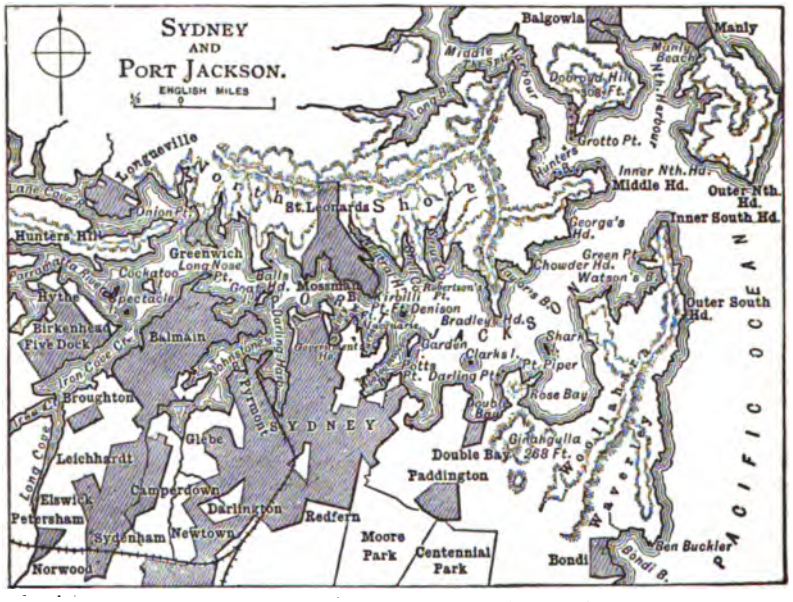
Zschokke's *History of Switzerland* (English translation); and *The Swiss Confederation*, by Adams and Cunningham.

Sword'fish, a large fish of the open sea, having the bones of the upper jaw extended into a long blade. There is only one species found abundantly in the Mediterranean, and less abundantly along the New England coast. It is also found in the Pacific and other seas. The body is rather elongated but stout, the dorsal fin is high, the ventrals are absent. These fish are dark blue in color, and range in size from four to fifteen feet or more, and from 150 to 800 pounds. They eat nearly all kinds of fish. Rising in the midst of a school, they strike several with the sword and eat them deliberately. They are sought as food, and harpooned from the bowsprit of small vessels. In former years about one and one-half million pounds, annually, were brought into eastern ports of the United States.

SWORDFISH.

Syc'amore, the common name in the United States of the plane or buttonwood tree, well known for its white bark and broad leaves, and round balls. The true sycamore is a species of fig, common in Egypt. The wood is so lasting that it was used for mummy cases. It is the tree mentioned in the Bible.

Syd'ney, a city of Australia, the capital of New South Wales, is on Port Jackson, a bay of the Indian ocean. The city looks like an old English town with some fine public buildings, as the exchange, the government house, the parliament houses, the treasury, the university, and two cathedrals. It has several fine parks and a botanical garden of 38 acres. There are four colleges connected with the university, which has a faculty of 49 members and an attendance of 519 students. There is also a college for women, a free museum, a free public library of 144,244 volumes, and an observatory. It has a fine harbor, with extensive shipyards and docks, and is defended by several forts and batteries. Population estimated 438,300.



Symbiosis (*sim-bī-ō'sis*) (in plants), the living together of two kinds of organisms in more or less intimate relation. The word sometimes has a very general application, including even such a case as a vine and the tree upon which it climbs. Generally, however, it is used only in connection with cases of intimate organic union. The most notable case is the association of an alga and a fungus in the formation of a lichen. Various forms of symbiosis are recognized, dependent upon the significance of the relationship between the two symbionts. Parasitism is one form, in which one symbiont is more or less injurious to the other. This form is amply illustrated by the numerous cases in which parasitic fungi attack living plants and animals. Mu-

tualism is that form of symbiosis in which the relation between the two symbionts is mutually helpful. Many botanists consider the lichen an illustration of this, in which the alga and fungus are of help to one another. (See LICHENS.) Helotism is a form of symbiosis in which one organism enslaves another in order to use its products. In this case the enslaving symbiont is benefited, while the enslaved symbiont is neither injured nor benefited. Many botanists think that this is the form of symbiosis displayed by lichens, the fungus enslaving the alga in order to obtain the food which it manufactures, and still protecting it within the meshes of the mycelium. (See LICHENS.) Root tubercles and mycorrhiza (see both) are also illustrations of symbiosis of complex character. In fact, the phenomenon of symbiosis is displayed more extensively among plants than was formerly supposed.

Symmes, John Cleves, an American pioneer, was born on Long Island in 1742. He obtained from congress in 1788 a grant of 1,000,000 acres along the Ohio, between the two Miami rivers, and a colony from New Jersey made the first settlement on the land, naming the town Losantiville, which was changed by Governor St. Clair to Cincinnati. Symmes City was also founded at North Bend, a few miles below, and for some years was a rival of Cincinnati, until Fort Washington was established at the upper town.

Symmes, John Cleves, nephew of the above, was born in 1780 in New Jersey. He was in the War of 1812, and afterward settled at Newport, Ky., where he developed, in lectures and writings, his idea that the earth is a hollow globe, and can be inhabited. He died at Hamilton, O., May 28, 1829.

Symonds (*sim'ondz*), **John Addington,** an English man of letters who wrote largely on Italian history and literature, was born at Bristol, Oct. 5, 1840, and died at Rome, April 19, 1893. His chief writings are an *Introduction to the Study of Dante; Studies of the Greek Poets; Sketches in Italy and Greece; The Renaissance in Italy; Italian Byeways;* with *Lives* of Shelley, Ben Jonson, Sir Philip Sidney, Boccaccio, Benevento Cellini, Michael Angelo, and *Shakespeare's Predecessors in the English Drama.* His work is marked by accurate learning and much critical insight. *The Renaissance in Italy* is his chief work, which forms in its several parts seven volumes, and on which the author spent eleven years of intelligent labor.

Sympathet'ic Nerv'ous Sys'tem, a nervous system developed in vertebrated animals above the fishes. It consists of a double row of ganglia united by nerve trunks, and is located within the cavity of the body, along each side of the spinal column. In this way two chains are formed, reaching from the base of the skull to the end of the body cavity. The ganglia are collections of gray matter, or nerve cells, and nerve fibers pass through them to and from the spinal cord. The sympathetic system is connected with the central nervous system by numerous nerve trunks, or communicating branches. It also sends branches to the viscera. It acts as a kind of relay center for regulating the blood supply to the abdominal viscera, and assisting in other involuntary actions. See Gray's or Quain's *Anatomy* for a longer description.

Sympetalous (*sim-pĕt'al-ŭs*) **Flowers,** those in which the petals are more or less united, as distinguished from those which are polypetalous, in which the petals are entirely distinct from one another. The sympetalous condition is characteristic of families of the highest rank, in which the corolla takes such forms as a bell, urn, tube, trumpet, etc. The noun form is "sympetaly." Equivalent terms are "gamepetalous flowers" and "monopetalous flowers." See FLOWER.

Synagogue (*sĭna'-gŏg*), the name of the Jewish house of worship, or church. Synagogues were first established in Judæa, when the country was under the Greek and Persian rule, and were sometimes used for schools. The synagogue has seats and desks on the floor for the men, and galleries for the women. There is an ark containing the Hebrew copies of the books of Moses, and a platform for the reader, and a smaller platform for the preacher or lecturer. The congregation must face the east while certain prayers are recited. Modern synagogues have arrangements for a choir and are more like Christian churches.

Syncarpous (*sĭn-kär'pŭs*) **Flowers,** those in which two or more carpels are organized together to form a single pistil, commonly called a "compound pistil." The contrasting term is "apocarpous," or "carpels distinct from one another." See FLOWER.

Synergids (*sin'er-jids*) (in plants), two cells which are associated with the egg in angiosperms, and with it form the group of three cells, called the "egg apparatus." This group is situated at the micropylar end of the embryo sac, to which the pollen tube comes. The name means "helpers," and refers to the fact that these cells are of service in the process of fertilization. During this process one of the synergids becomes disorganized, contributing of its substance to the nourishment of the pollen tube and its contents. See EMBRYO SAC.

Syracuse (*sĭr'a-kūs*), a city, once the largest city of Sicily, its walls being 22 miles around, and its inhabitants numbering anywhere from 500,000 to 1,000,000. It was formed of five towns, and was sometimes called Pentapolis. Ortygia, the first part of Syracuse, was built on a small island, connected with the mainland by a causeway. The modern city is fortified, and has palaces.

churches, convents, and a fine cathedral, built on the site of the ancient temple of Minerva. There are many ruins of the ancient city — the old theatre, cut out of the rocks, with sixty rows of seats, for 24,000 spectators; ancient quarries, 60 to 80 feet deep, sometimes used as prisons, one of them being called "the ear of Dionysius"; a great aqueduct; and extensive catacombs. The fountain of Arethusa, on the island of Ortygia, has been restored by the city. The trade is in wine, brandy, oil, fruits, salt, saltpeter, and sulphur. Syracuse was founded by the Corinthians in 734 B. C., and grew rapidly, sending out several colonies. The government was in the hands of a few leading families, and in 487, after a revolution in which the people had driven them out, they returned, and the despot or "tyrant," Gelon, became master of Syracuse. He was a great ruler and the city prospered under him, as also under the reign of his successor, Hiero. In 466, Thrasybulus was expelled and the city enjoyed a free government for sixty years, during which it was victorious over Athens. Dionysius restored the "tyranny," strengthened the city, and overcame Carthage. In 212 B. C., the city, which had joined the Carthaginians, was conquered by the Romans. It was burnt by the Saracens in 878, and has been three times nearly destroyed by earthquakes. Its present population is estimated at 26,346.

Syr'acuse, a city of New York, is on Onondaga lake, about half way between Albany and Buffalo. It is a handsome city, with broad, shaded streets and ornamental squares. The state armory, asylums for idiot and for orphans, a home for aged women, savings bank, courthouse, etc., are among the fine buildings. The great industry is the manufacture of salt, which has been made in the region since 1654, when the springs were visited by Jesuit missionaries and the salt carried to Quebec. There are a large number of companies engaged in the business, and several millions of bushels of salt are yearly produced. Other manufactures are extension tables, musical instruments, picture frames, mowers and reapers, boots and shoes, hardware, and cigars, with Bessemer steel works, blast furnaces, foundries, etc. The city annually expends $402,714 to maintain its public schools, which have a force of 474 teachers, and an attendance of 19,064 pupils. Syracuse university is on a hill overlooking Lake Onondaga, was founded by the Methodists in 1870, and has three departments, liberal arts, fine arts, and medicine. There is a hall of languages, the Holden observatory, and a library building containing Leopold Von Ranke's fine historical collection of books. Syracuse was first settled by an Indian trader in 1787. In 1789, it was called Salt Point, and the manufacture of salt begun by white settlers. The place was soon called Salina, and grew slowly until it was incorporated as a village in 1825. In 1847, Salina and Syracuse, which were rival villages, were united with the name Syracuse. Population 108,374.

Syr'acuse Univer'sity, Syracuse, N. Y., a coeducational institution, has colleges of liberal arts, applied science, fine arts, medicine, and laws. It has 150 instructors and lecturers, with an attendance of 1,600 students.

Syria (*sir'i-a*), a division of Turkey, lying on the Mediterranean sea between Asia Minor and Arabia, including 109,509 square miles. The country is crossed from north to south by a double mountain chain, Lebanon, the highest part having its summit 10,000 feet above the sea. The valley between the two ranges, Lebanon and Anti-Libanus, is about 2,300 feet above the sea, and was the site of the cities of Heliopolis and Baalbek. This valley separates into two parts, through one of which the Leontes river makes its way to the Mediterranean, while the other descends rapidly to the valley of the Jordan. At the lake of Tiberias the valley is 650 feet below the level of the sea, and at the Dead sea, 60 miles below, it is 1,300 feet below sea level. The region around the Dead sea is full of salt and without vegetation. The coast line of Syria is broken by the bays of Tripoli, Beyrout, Acre, and Saida. The Jordan, Litany (Leontes), Asi (Orontes), Barada, and Awaj (the Abana and Pharpar of the Bible) are the principal rivers, with the Euphrates on the eastern border. The plains of Esdraelon, Sharon, and Gaza are level tracts, and the region around Damascus is a sandy desert in which are the ruins of Palmyra. Iron, quicksilver, coal, salt, and bitumen are the minerals of the country. The climate varies from the cool summers of the slopes of Lebanon to the tropical heat of the Jordan valley, with a dry season from April to October. In spite of the imperfect methods and ancient implements used in agriculture, the crops are large. Wheat, barley, rice, cotton, hemp, indigo, tobacco, are important crops, while all kinds of fruit are grown. Vineyards cover the hills, and forests of cedar and pine the mountains. The horses are very strong and handsome; the broad-tailed sheep is found here only; cattle are small and poor, and wild animals abound in the mountains. The manufactures of the country are unimportant, though the rearing of silk worms is carried on extensively. Its chief city is Damascus, with a population of 140,500.

The people of Syria are of many races and sects. The Mohammedans are mostly Arabs though there is a small proportion of Turks, the ruling race. The Mohammedans, Druses, Maronites, Greeks, that is, adherents of the Greek church, Armenians, Catholics, Protestants, and Jews represent the religious divisions. The schools are carried on mainly by

the Greeks, Catholics, and especially by the Protestant missionaries, who founded the college at Beyrout. The Syriac language belongs to the Semitic group, and is an Aramaic dialect. The ancient Syriac is still the sacred language of the remnants of the Christian churches of Syria and Asia Minor, though it is practically a dead language to the best educated among them. The oldest book in Syriac still existing is a translation of the Bible, made about 200 A. D.

The Kingdom of Damascus, which occupied the central part of Syria, was conquered by the Assyrians about 740 B. C. Along the Mediterranean was Phœnicia, with such cities as Tyre and Sidon, the greatest commercial nations of the ancients, but conquered also by the Assyrians. Anakims, Canaanites, Ammonites, and Moabites were tribes living beyond the Jordan and in the southwestern parts of Palestine. The entrance of the Israelites into Palestine took place about 1500 or 1300 B. C., and their power lasted 1,500 years. A part of the nation, the ten tribes, were taken captive by the Assyrians in 721, the Samaritans found in the country at the time of Christ being descendants of the remnant of the Israelites and the colonists from Babylonia, that took the place of the captives. Judah fell before Nebuchadnezzar, but the people were restored to their land after seventy years of exile, though the country was still governed by Persian rulers. The battle of Issus (333) gave Syria to Alexander the Great, but at his death the country was divided, Egypt holding Palestine, and Seleucus Nicator ruling northern Syria, where he built Antioch, for many centuries one of the greatest of eastern cities. Syria was conquered by the Romans about 63 B. C., and ruled by Roman officers. In the 7th century A. D., it became a part of the Mohammedan empire, and in the 11th century was in the hands of the Seljuk Turks, whose cruel treatment of Christian pilgrims led to the crusades. The Christian princes ruled only a short time, the land being overrun by the Mamelukes and the opposing forces of Tamerlane. Since 1517 it has belonged to the Ottoman empire. Population 3,317,600.

T

Tab'ernacle was the tent first raised by Moses in the desert as a sign of God's presence among the people. It was divided into the sanctuary proper, which formed the front part, and the holy of holies. A sort of court yard, formed by curtains hung between columns, ran round the tabernacle. The entrance was toward the rising sun, and was shut in by another costly curtain, into which, as in the first covering, figures of cherubim were woven. The court was much larger on the eastern side, for here the people gathered to worship. Here also stood the altar, made of acacia wood, on which a fire was kept burning, and the brazen laver or basin. The sanctuary contained the gilded table holding the showbread, the golden candlesticks, and in the center the golden altar of incense, upon which the high priest burned incense morning and evening. In the holy of holies was kept the ark of the covenant, an acacia wood box, gold-plated and gold-lined, in which was kept the two tables of the Ten Commandments. On top of the ark were the two cherubim, and between them the symbolical presence of the Jehovah — the Shechinah.

Only once a year, on the Day of Atonement, did the high priest enter the holy of holies, while the sanctuary was the ordinary place of the priests, and the court that of the Levites. The Levites had charge of the tabernacle, carrying it from place to place on the march of the Israelites. The tabernacle was permanently set up in Shiloh, and was probably removed to Nob and thence to Gibeon, from which Solomon seems to have carried it away, in order that all the nation might worship at Jerusalem.

Ta'bor, a celebrated mountain of northern Palestine, rising from the plain of Esdraelon to a height of 1,000 feet and commanding the widest and finest view in Palestine. It is thickly clad with forests of oak and other trees. It was renowned from early times as the place of Christ's transfiguration, though it is now believed that at one time a city stood on its summit. In the times of the crusades, Tabor was studded with churches and monasteries. Here Deborah and Barak summoned the warriors of Israel before the battle with Sisera; ten thousand Jews were slain near by in a battle against the Romans in 55 B. C.; and at its foot Napoleon gained a great victory over the Turks.

Tabriz (*tä-brēz'*), an old city of Persia, on the Aji river, forty miles from lake Urumiah. A ditch and a brick wall with seven gates surround the city. Water, a rare thing in the east, is plentiful. The fine ruin, the "Blue Mosque," is covered in part with arabesqued blue tiles. The citadel is a brick building, whose walls have been cracked by earthquakes. The chief manufactures are leather, silk, and gold and silver smithing. Tabriz is on a caravan route, and is a city of business importance, doing a large trade with Russia.

Tabriz, the ancient Tauris, became the capital of Armenia in 297 A. D. Zobeida, the wife of Haroun-al-Raschid, greatly enlarged it. It was sacked by Timur in 1392, and after being held by the Turkomans, was taken by the Persians in 1500. The place has often been damaged by earthquakes, that of 1721 causing, it is said, the death of 80,000 persons. Population 180,000. See Eastwick's *Three Years' Residence in Persia.*

Tacitus (*tas'i-tus*), **Calus Cornelius,** the Roman historian, was born probably about 55 A. D. He enjoyed the favor of the emperors Vespasian, Titus, and Domitian, and married a daughter of Agricola. He held several public offices, became known as an orator, and was a close friend of the younger Pliny, through the appointment of the two to carry on the prosecution of Marius. Eleven of his letters are addressed to Pliny. Tacitus probably lived for a time after Hadrian came to the throne. His *Life of Agricola* is one of the finest biographies which has yet been written. His other works are *Histories*, *Annals*, *Germany*, and his first and less valuable *Dialogue on Orators.* These histories are the most trustworthy sources of knowledge of the times of which they treat, and have given their author high rank among the world's historians. He died, it is thought, in 118 A. D.

Tacoma (*tă-kō'mă*), a city of Washington, is on Puget sound, at the head of navigation. The sound, which is from three to five miles wide, narrows near Tacoma to an inlet less than a mile wide and five miles long. The city is built on a bluff, 200 feet high, overlooking the sound and the Cascade range, with the snowy peaks of Mt. Tacoma in the distance. The city was laid out by the Tacoma Land company, an organization by the managers of the Northern Pacific railroad, which in 1873 bought 16,000 acres near the little village of Tacoma, that consisted of one sawmill and the houses of its workmen. They made it the terminus of their road and built there two hotels, the last one costing three-quarters of a million of dollars. The salmon fisheries of Puget sound, the hop fields in Puyallup valley, the great forests of white pine and cedar on the neighboring mountains, and the coal and iron and other minerals of the region, furnish the materials of the large trade of the city. A regular transport service has been established between Tacoma and London, trains laden with hops meeting the steamers at New York, and its harbor is a starting point of steamers for Alaska. The works of the Tacoma Lumber

company cover 80 acres in the city, and they own 150,000 acres of timber land and 5,000 acres of coal land. The lumber and other products are loaded at the wharves of the city for China, Japan, and Australia. There are also large smelting works and wheat elevators. Population 37,714.

Tadolini (*tad-o-lē'nē*), **Adamo,** an Italian sculptor, born at Bologna in 1789. In 1812, his *Dying Ajax* gained him a grand prize. Among his works are *The Abduction of Ganymede*, *A Bachante*, and a *Statue of Washington.* He died in 1872.

Taft, Lara'do, American sculptor, was born at Elmwood, Ill., April 29, 1860, and graduated at the University of Illinois, and at the École des Beaux Arts, Paris. In 1886, he settled in Chicago, and became instructor in the Art Institute in that city and lecturer on art at the University Extension department of the University of Chicago. He has produced many busts and ideal subjects, and among other fine decorative work undertaken by him he decorated the Horticultural building of the World's Columbian exposition. The symbolic beauty and fine workmanship of these decorations won for the artist-sculptor great praise. Among his many busts, etc., are those of Schuyler Colfax, in Indianapolis, a statue of General Grant, and the fine reliefs for the Michigan regimental monuments on the field of Gettysburg. Mr. Taft is a member of the American Sculpture society and of the Western Society of Artists.

Taganrog (*tăg-an-rŏg'*), a seaport of south Russia, stands on the north shore of the sea of Azov. It was founded by Peter the Great in 1696. The shallow harbor forces ships to unload into barges half a mile from the quay. Wheat is the chief export, but linseed, skins, wool, etc., are also sent out. The place is strongly fortified and is the main port of the sea of Azov. Alexander I. built a beautiful palace and has a monument here. Other buildings are the admiralty, cathedral, and marine hospital. French and English gunboats damaged Taganrog by bombardment in 1855. Population 51,965.

Taglioni (*tăl-yo'nē*), **Maria,** perhaps the world's greatest dancer, was born at Stockholm in 1804. Her father was a noted Italian ballet master, and under his guidance she first danced at Vienna in 1822. Five years later, Paris went wild over the accomplished ballet girl. She married Count Gilbert de Voisin in 1847, and left the stage. She died in 1884.

Ta'gus, the largest river of the Spanish peninsula, rises on the frontier of New Castle and Aragon, flows through the Spanish and Portuguese territory, and, after a course of 540 miles, falls into the Atlantic by an inlet at some places five miles broad. Near its source, and also near Toledo, the river runs between rock walls several hundred feet high. The navigable part of the river, 115 miles, is wholly within Portugal. Lisbon and Toledo are on the Tagus.

Tail'or Bird, a small bird about the size of a warbler, living in India, Ceylon, and southern China. There are about seven species. The common tailor bird is olive green above and yellowish white underneath, with a pale brick-red crown. In making its nest, leaves at the end of a twig are sewed together, or sometimes the edges of one large leaf are united. The bill is used as a needle and fibers and grass are used as threads. This habit gives it its name of tailor bird. The united leaves do not form the nest, but are merely a receptacle for it. The nest proper is made of wool and vegetable fibers and is lined with hair.

NEST OF THE TAILOR BIRD.

Taine, Hippolyte Adolphe, a well-known French critic, was born at Vouziers, France, April 21, 1828. He studied at the Bourbon college, and in 1864 was made professor of the history and æsthetics of art in the school of arts. One of his first essays was crowned by the French academy. Among his most important works is *History of English Literature*, a clear and valuable criticism written in brilliant style. In 1871, the University of Oxford conferred upon him the honorary degree of LL. D., and in 1887, he was elected to membership in the French academy. His other writings embrace *Voyage in Italy*, *Voyage to the Pyrenees*, *The Ancient Régime*, *Notes on England*, and *The Ideal in Art.* He died at Paris, March 5, 1893.

Tai-pings, the name given to the Chinese rebels who rose in 1850 and laid waste some of the best provinces of China. The capture of Pekin by French and English troops in 1860, followed by a treaty, giving foreign merchants valuable privileges, made it to the interest of the American, French, and English governments to re-establish order in China. An American citizen, Ward, who had taken service under the emperor, showed a remarkable talent for disciplining irregular troops, and was the chief means of the success of the imperial forces in defeating the rebels at Shanghai in 1860 and 1862. In this

year Ward was killed, and "Chinese" Gordon was placed in command of his force, which became famous as Gordon's brigade. The Tai-pings were defeated in over sixteen engagements, and in 1864 almost every important city held by them was captured. The rebellion was not, however, stamped out until 1867.

Tait, Peter Guthrie, an eminent Scotch physicist, was born at Dalkeith, April 28, 1831, and died at Edinburgh, July 4, 1901. He was educated at he Edinburgh academy and university, and later at St. Peter's college, in Cambridge, where he graduated senior wrangler, and first Smith's prizeman. In 1852, he was appointed a Fellow of Peterhouse; and in 1854, professor of mathematics in Queen's college, Belfast; but since 1860 he has been professor of natural philosophy in Edinburgh. Few men have ever exercised a more thoroughly healthful influence on the teaching of physics than the subject of this sketch. At the same time he has set a wholesome example, to both students and instructors, by a very important series of contributions to knowledge. As evidence of this, witness the two quarto volumes of his *Scientific Papers* recently (1898) published by the Cambridge Press. Among his other important publications may be mentioned: *Dynamics of a Particle*, 1856; *Quaternions*, 1867; *Recent Advances in Physical Science*, 1876; Thomson & Tait's *Natural Philosophy;* and a series of textbooks covering the ground of his university lectures.

Taj Mahal (*tăzh ma-häl"*), a costly tomb built in Agra, India, by the Mogul emperor, Shah Jehan, as a burial place for his favorite wife, Noor Mahal. It is said to have cost $4,000,000, and its building employed 20,000 workmen for twenty-two years. It is of white marble, 100 feet long and wide, and 200 feet high. It is an eight-sided palace resting on a marble terrace, supporting which is a terrace of red sandstone. A dome flanked by cupolas surmounts the building and minarets rise from the four corners of the marble terrace. Inside and outside are mosaics of precious stones and beautiful tracery. The whole Koran is written in precious stones on the walls. This tomb of tombs has been described by travelers as "a glimpse of Paradise."

Talc (*tălk*), a mineral consisting of magnesium silicate containing a little water, much like mica in appearance, and easily divided into thin flakes, which can be bent and are transparent, but are not elastic like mica flakes. It is much softer than mica, however, and can be readily scratched by the finger nail, and feels greasy when rubbed with the fingers. It is silvery white, greenish white, and green with a pearly luster. It is found in crystalline and in masses. The massive varieties cannot always be separated into flakes. Massive talc, called also soapstone, steatite, potstone, and French chalk, is quarried in large quantities in Vermont, New Hampshire, Massachusetts, Maryland, Virginia, and North Carolina, and in smaller quantities in other states. Soapstone in slabs is largely used for wash tubs, etc., and for tables in chemical laboratories. It does not crack when exposed to moderate heat as slate usually does.

Tallahassee (*tal-la-has'sē*), the capital of Florida, stands on high ground, twenty-one miles north of the gulf of Mexico. The capitol was begun in 1826. There are railroad car and machine shops, a cotton factory, and a seminary. The old Spanish fort of San Louis is near by, and sixteen miles away is the well-known and beautiful spring Wakulla. The town is noted for its flowers. Tallahassee was made the territorial capital in 1822, but was not laid out until 1824. Population 3,931.

Talleyrand (*tal'li-rănd*) **Perigord, Charles Maurice,** Prince, a famous French diplomatist, was born at Paris, Feb. 14, 1754. His father, count of Talleyrand, would have had him enter the army, had he not been accidentally lamed when a child. So he became a priest and rose to be bishop of Autun. As a member of the national assembly of 1789 he was a hearty friend of Mirabeau, and at the feast of the federation in the next year, he headed a procession of 200 priests wearing the national colors over their white robes and performed mass on the altar set up in the Champ Mars. After the fall of Louis XVI., Talleyrand went to England, and then to the United States, where he reaped a fortune by speculation. He went back to France as soon as his name was crossed off the list of exiles, and in 1797, as the newly appointed minister of foreign affairs, welcomed Napoleon on his return from his famous Italian campaign. He greatly helped Napoleon to seize absolute power, and as his minister of foreign affairs became the most able diplomat in Europe. An estrangement, however, separated the two co-workers, Talleyrand resigning in 1807. To his intrigues was chiefly due Napoleon's fall in 1814, for which treachery he was for the third time made foreign minister by Louis XVIII. At the time of Napoleon's return from Elba, he was in Austria as French commissioner to the congress of

TALLEYRAND.

Vienna, but after the battle of Waterloo accompanied the king to Paris. He soon resigned his office, but still had great influence throughout the nation, men of all parties thronging his salon. He came to the front again after the revolution of 1830, as ambassador to England. His personal *Memoirs* and his *Memoir on the Commercial Relations of the United States*, are the most valuable of his writings. He died May 20, 1838.

Tallien (*tă-lyăn'*), **Jean Lambert,** a French revolutionist, was born at Paris in 1769. He first came to the front in 1792 as editor of a Jacobin newspaper, which gave him great influence. As secretary of the Commune he helped on the September massacres. He was a supporter of Marat, and was eager for the death of Louis XVI. and the Girondists. In 1793, he was sent to Bordeaux to root out this party, where he gained lasting infamy by his reckless cruelty. In 1794, he came back to Paris to become president of the convention, and to save himself from the attacks of Robespierre, he organized the destruction of the Terrorists, though he had himself been perhaps more guilty than they. Tallien now became one of the most influential men, but his past crimes could not be forgiven, and in 1798 he was forced to leave the council of five hundred. He died Nov. 16, 1820.

Talmadge (*tăl'mij*), **Thomas De Witt,** American Presbyterian clergyman and lecturer, was born at Bound Brook, N. J., Jan. 7, 1832, and was educated at the University of the City of New York, and a graduate of the Theological seminary of New Brunswick, N. J. He was pastor successively of the Reformed Dutch churches at Belleville (N. J.), Syracuse (N. Y.), and Philadelphia (Pa.), and from 1869 to 1894 he was in charge of the Central Presbyterian church at Brooklyn, N. Y. In 1895, he accepted a call to the First Presbyterian church at Washington, D. C. He is the editor of *The Christian Herald*, and has been also editorially connected with *The Christian at Work*, *The Advance*, and with Frank Leslie's *Sunday Magazine*. He has published, besides many volumes of lectures and sermons, the following: *Crumbs Swept Up*, *Around the Tea-Table*, *Mask Torn Off*, *Abominations of Modern Society*, *The Marriage Ring*, *Old Wells Dug Out*, *The Pathway of Life*, *Everyday Religion*, *From Manger to Throne*, *Woman: Her Powers and Privileges*, *Sundown*, etc. Died Apr. 12, '02.

Tal'mud. See LITERATURE, JEWISH.

Tambourine (*tam-bŏr-ēn'*), a very old musical instrument, used by Basques, Italians, and Gypsies. It is a piece of parchment stretched on a hoop furnished with little bells, and is sounded by the hand, fingers, or elbow. It is used to accompany singing and dancing, and has been adopted by the Salvation Army.

Tam'erlane. See TIMUR.

Tam'many Society, the most powerful political club in the world, is an organization of the Democratic party in New York city, which was founded in 1789. It was nearly ruined at the time when both the city and it were under control of the Tweed ring. It has been more or less opposed by outside Democrats in New York at various times, but is to-day supreme in the councils of the party.

Tam'pa, Fla., a thriving city and port of entry at the head of Tampa bay and the mouth of Hillsboro river, the capital of Hillsboro county, thirty miles from the gulf of Mexico, in western central Florida. It has a spacious harbor, and has steamship connection with Mobile, New Orleans, New York, Havana, Key West. It has railway connection with the Florida Central and Vennisula, the Savannah, Florida and Western, and other railroads. Its chief industry is the manufacture of cigars; fruit culture, the fishing trade, and the shipment of phosphate are other occupations of its townspeople. Population 15,839.

Tampico (*tăm-pē'kō*), a Mexican seaport in the state of Tamaulipas, on the Panuco, five miles from the gulf of Mexico, and 235 miles northwest of Vera Cruz. Its harbor has a dangerous bar, and is unsafe. Trade is carried on chiefly with New York, New Orleans, and Liverpool. Population about 8,000.

Tanager (*tăn'a-jēr*), the name for members of a large family of birds mainly confined to tropical America. There are about 350 species. Two forms are abundant in the eastern and southern United States. The scarlet tanager is our most brilliantly colored bird, and is familiar to most people who live within its range. It is a little more than seven inches long; the male, during the breeding period, is bright red with black wings and tail, the female is clear olive green above and greenish yellow below. After the nesting period the male becomes colored like the female. They inhabit both high and low woods and usually nest in oaks. Our other tanager is the summer redbird, a more southern species, which ranges north to New Jersey and southern Illinois. The male is bright rose red throughout, with the wings a little dusky. The female is dull olive above and yellow below.

Tananarivo (*tă-nă'nă-rē-vō'*) or **Antananarivo,** the capital of Madagascar, and residence of the sovereign of the island, is built on a long hill 7,000 feet above the sea. The houses are of wood or bamboo, roofed with bamboo or mats. The palace is sixty feet in height, and stands on the top of the hill. Courts are held in the open air near the house of the prince royal; and public meetings take place in a great natural amphitheatre, holding 100,000 persons. Witches and sorcerers are

thrown over a precipice 300 feet high. The habits and ways of the people have been greatly bettered under the teaching of missionaries. Population estimated at about 260,000.

Tancred (*tang'kred*), an Italian prince, was born in 1078. He joined the crusaders under his cousin, Bohemund, the son of the crusader, Robert Guiscard. He fought bravely at the siege of Nicaca in 1097, and in the battle of Dorglaeum saved the Christian army from being cut to pieces. In the massacre which followed the capture of Jerusalem, whose walls he was one of the first to mount, he alone had any mercy for the conquered, in whose behalf he risked his own life. Tancred defeated the advance guard of Saladin, and had a great share in the capture of Ascalon. After taking Tiberias he was made prince of the city. He defended against great odds the city of Antioch, whose governor his cousin Bohemund had left to raise recruits in the west. Tancred carried his arms as far as Tripoli, and succeeded in driving the Saracens out of Syria. He died at Antioch in 1112. He is one of the leading heroes of Tasso's famous poem, *Jerusalem Delivered.*

Taney (*taw'nĭ*), **Roger Brooke,** chief-justice of the United States, was born in Calvert county, Md., March 17, 1777. He was graduated at Dickenson college, Pennsylvania, studied law, and took part in politics as a Federalist. He afterward became a Jackson Democrat and was made attorney-general in President Jackson's cabinet in 1831. Two years later, he was appointed secretary of the treasury, as his chief knew that he could be depended upon to remove the government deposits from the United States bank to local banks, the refusal to do which had caused the dismissal of Secretary Duane. Taney succeeded the great Marshall as chief-justice of the supreme court in 1837. His most famous decision was that in the Dred-Scott case, in 1857, in which the negro Scott brought suit to gain his freedom, on the ground of his having been carried by his master from the slave state Missouri into free territory. The decision, denying the right of citizenship to negroes, and also the authority of congress to keep slavery out of the territories, caused a greater excitement throughout the country than any decision of the supreme court before or since. Chief-justice Taney died at Washington, D. C., Oct. 12, 1864. See *Life*, by Prof. Samuel Tyler.

Tanganyika (*tăn-găn-yē'kă*), meaning "the meeting place of waters," is the name of a great Central African lake discovered by Burton and Speke in 1858. It lies south of Victoria Nyanza and Albert Nyanza, and northwest of Lake Nyassa; it is about 400 miles long and from 10 to 60 miles wide, and is about 2,700 feet above the ocean. A wide bay at the southern end was named Lake Liemba by Livingstone. The eastern coast is hilly, and the western coast mountainous and covered with forests. There are many small rivers flowing into it, and the river Lukaga flows from it, though Burton thought that it acts only as a drain in the rainy season, returning its waters to the lake in the dry period. Ujiji, where Stanley found Livingstone, is the principal town on the lake.

Tangier (*tăn-jēr'*), a seaport of Morocco near the western entrance of the strait of Gibraltar, is built on high ground and is defended by forts. It is the principal center of commerce in Morocco, has important trade with Europe, doing a foreign business of $3,000,000 yearly, and is the residence of consuls and the diplomatic corps sent to Morocco. Tangier, once called Tangis, is an old city, and is thought to have been founded by the Carthaginians. It became the capital of a Roman province, was held by the Portuguese for nearly two centuries, and in 1662 was presented to Charles II. of England as part of the dowry of Catherine of Braganza. England held it for twenty-two years. In 1844 it was bombarded by the French. Population about 30,000.

Tanjore (*tăn-jōr'*), an Indian city, 180 miles southwest of Madras. There are two strong forts; in the larger one, is the rajah's palace, in the smaller, one of the finest of Indian pagodas. Silk, muslin, and cotton cloths are manufactured. Tanjore was first the capital of a Hindoo state of the same name, which was conquered by the Mahrattas, and fell into the hands of the British about 1800. Population 54,390.

Tannhauser (*tan'ow-zer*), a famous knight of the middle ages, who, according to the German legend, goes to Venusberg and enters the cave palace to behold the wonders of the Lady Venus and her court. Conscience smitten at the life of careless pleasure he lives here, he betakes himself to Rome to crave forgiveness of the pope. The pope, however, holding a wand in his hand tells Tannhäuser that he can as little get God's forgiveness as that dry wand can become green again. In despair the knight goes back to Lady Venus in the mountain. But three days afterward the wand begins to sprout and bears green leaves, and the pope at once sends messengers to every country, but in vain — Tannhäuser can nowhere be found. Such is the story as told in the popular ballad once sung all over Germany. On this Saga, Wagner based his well-known opera, *Tannhäuser.*

Tan'nin or **Tan'nic Ac'id** is of great importance in tanning leather. The chief source of tannin is oak bark, though in America hemlock bark is much used, while the mimosa or wattle barks of Australia are also important. However, tannin is found in the bark

and leaves of most forest trees, as the elm, willow, horse chestnut, and pine, and in many fruit trees, as the pear and plum. Coffee, tea, and especially Paraguay tea, also contain tannin.

Tantalus (*tan'ta-lus*), noted in Greek myth for the punishment he received in the lower world. He was the son of Zeus, and for making known the counsels of his divine father, or for other reasons, — the stories differ, — he was in the lower world stricken with a fearful thirst, and had to stand up to the chin in a lake, the waters of which escaped him whenever he tried to drink. Clusters of fruit hung over his head, but missed his grasp whenever he reached for them; at the same time he was in terror lest a huge rock, hung over his head, and ever threatening to fall should crush him. From Tantalus comes our word "tantalize."

Tapajos (*tä-pä-zhōs'*), an important river of Brazil and a branch of the Amazon, is formed by the junction of the Arinos and the Juruena. After flowing north for over 1,100 miles, the Tapajos falls into the Amazon twenty miles below the town of Santarem. Its upper waters are only eighteen miles from those of the Paraguay. There is one fall of thirty feet, but otherwise the river is navigable for the greater part of its length.

Tap'estry, an ornamental figured cloth, used for lining walls and covering furniture. The Jews and Egyptians were skillful tapestry workers. In France, the ladies of the nobility used their needles in making beautiful tapestry for the adornment of churches and monasteries. About the 9th century this work began to be done by the loom. The Flemings excelled in tapestry weaving, and in the 14th and 15th centuries the factories of Brussels, Bruges, Antwerp, Lille, and Valenciennes were noted, and in the next century the factory at Fontainebleau. The art of weaving tapestry was introduced into England near the end of the reign of Henry VIII. A famous and very old factory is that of the Gobelins at Paris. So slow is the work that thirty-nine square inches is considered a fair year's work for one artist. Perhaps the most remarkable piece made by hand is the Bayeaux tapestry, which commemorates the Norman conquest. It is 214 feet long, and is of great historical value, as it shows the old Norman costumes in great detail, and also pictures events of the conquest not mentioned by any chronicler.

Tapio'ca, a farinaceous substance prepared from cassava meal, which, while moist or damp, has been heated for the purpose of drying it on hot plates. By this treatment the starch grains swell, many of them burst, and the whole agglomerates in small irregular masses or lumps. In boiling water it swells up and forms a viscous jelly-like mass.

Ta'pir, the name for several thick-skinned mammals with elongated snouts, inhabiting India, the adjacent Malayan islands, Central and South America. The tapirs, united with the rhinoceroses and horses, form a group of odd-toed ungulates, or hoofed animals; all other hoofed animals having an even number of toes. The tapirs have three toes behind and four on the front feet, but only three of these are used. The Old World tapirs are larger than those of the New World, the common Indian form being eight feet long and thirty-nine inches high at the shoulders. Their legs and front part of their body are black, but the sides and back of the hinder portion are white (see illustration). Those of the New World are brown or blackish when adult. The common South American form is about seven feet long, and inhabits thickly wooded districts as far as the Andes. It is there replaced by a mountain form living at altitudes of 7,000 and 8,000 feet. There are also two species in Central America whose habits are little known. Tapirs commonly feed on young leaves, shoots, and fruits. Those of South America are destructive to plantations. They are hunted for their flesh and hides.

MALAY TAPIR.

Tar, an impure turpentine got by burning the wood of pine and cone-bearing trees, and by distilling peat, bituminous coal, and shale. The early Greeks made tar, and the people living along the gulf of Bothnia now make it in the same way, by burning wood in a heap covered with turf, much as charcoal is made. In Sweden, trees are partly stripped of their bark, and when cut down, some six years later, are found much richer in resinous matter. In the United States, most wood tar comes from North Carolina, though it is also made in other parts of the country. It is usually made of pitch pine, and is burned in tar kilns, which are piles of pine billets in the form of an inverted cone, covered with logs, green twigs, and earth. The kiln is lighted at the top, and the tar runs out through a wooden spout at the bottom.

Coal tar is made when illuminating gas is manufactured from bituminous coal. For a long time this tar was a mere waste product, but it is now widely used as a covering to protect iron work from the weather; and the pitch is used for pavements, roof covering, etc. By distilling coal tar, benzene or benzol and other volatile products are obtained, which are very valuable as raw materials in the preparation of artificial dyes.

Tarantula (*tä-ran'tū-lä*), the name commonly applied to any large running spider of

warm countries. The true tarantula is a native of southern Europe, and got its name from being common in the neighborhood of Taranto, Italy. The bite was considered very dangerous, and was fabled to produce an epilepsy which could be cured only by dancing, until exhausted, to lively music of a particular kind. The tarantulas, using the name in its wide meaning, are dark colored, hairy spiders, with mandibles that work up and down, instead of sideways, as is the direction in most other spiders. They live under rocks and in holes which they make in the ground and line with silk. They do not spin webs, but rush upon passing insects and other prey.

Tarifa (*tä-rē'fä*), a famous Spanish city, is twenty-five miles southeast of Cape Trafalgar. It has old walls, towers, a fortress, and a Moorish castle. Tarifa was founded by the Moors, who forced all vessels passing through the strait of Gibraltar to pay tribute at this town, from which comes our word "tariff." The Castilians captured Tarifa in 1292 and held it in the face of several sieges by the Moors. The French besieged it in vain in 1811, but captured it in 1823. Population about 13,500.

Tar'iff, a table or catalogue of duties charged on different kinds of merchandise when imported into a country. The first tariff act in the United States was drawn up by Alexander Hamilton, then secretary of the treasury, in 1789. Its purpose was to put money into the country's empty treasury. It listed only 51 articles, and charged duties ranging from 5 to 15 per cent. Between 1789 and 1804 six acts amending or adding to the first measure were passed. The tariff of 1812 was a war measure and doubled all import duties.

The Lowndes-Calhoun bill of 1816 was the first tariff measure enacted to protect industries, in addition to producing a revenue. Many manufactures had sprung up during the war, and this bill was passed avowedly to protect these young industries. It was not wholly set aside till 1842. Under it ad valorem duties ranged from 7½ to 33 per cent. It was followed by the Clay tariff of 1824 and the "tariff of abominations," as it was called, of 1828, both of which further raised duties. The modifying tariff of 1832 endeavored to readjust duties more equally. The compromise tariff of 1833 provided for taking off one-third of the duties each year until a uniform rate of 20 per cent. should be reached.

The Polk-Walker tariff of 1842 owed its passage to Robert J. Walker, President Polk's secretary of the treasury. It remained in force until 1861. It threw overboard the idea of protection and aimed to be a tariff for revenue only. Duties were reduced considerably, and in 1857 further reduced to an average of 15.66 per cent.

The Morrill tariff of 1861 was avowedly protective, and more than doubled existing duties, which were raised higher yet by the bill of 1883. The McKinley tariff bill of 1890 increased duties about 60 per cent., though it also enlarged the free list. A special section which has proven to be of value in enlarging our foreign trade was inserted in this bill. It gave the President power to remove from the free list sugar, molasses, coffee, tea, and hides, in the case of any country which charged unreasonable duties on the products of the United States. This is known as the reciprocity section.

The election of 1892 placed in power the Democratic party, which was pledged to a tariff for revenue only. Accordingly, a measure known as the Wilson bill was passed, and became law in 1894. This law removed duties from raw materials, and effected lower duties in general. It also provided for an income tax, which feature was set aside by the supreme court. In 1896, the Republican party again came into power and the Dingley law was passed, which established a tariff on somewhat lower lines than the McKinley law.

Tarpeian Rock (*tär-pē'yan*), at first the name given to the whole Capitoline hill in Rome, but afterward only to the southern part of it. In the time of Romulus, a vestal virgin, Tarpeia, the daughter of the governor of the Roman citadel on the Capitoline, covetous of the golden bracelets worn by the Sabine soldiers, and tempted by their offer to give her what they wore on their left arms, opened the gate of the fortress to the Sabine king. Keeping their promise to the letter, the soldiers crushed Tarpeia to death beneath their shields, which were carried on the left arm, and she was buried on the part of the hill which bears her name. Afterward traitors were often hurled from the Tarpeian rock.

Tar'quin, the name of two kings of Rome. According to the story, Lucumo, the son of a Corinthian nobleman who had settled in Etruria, resolved to improve his fortune by going to Rome. On the way an eagle swooped down and snatching off his cap carried it high into the air, then descending, placed it on his head again. His wife Tanaquil, who was skilled in augury, prophesied from this omen the highest honors for her husband, who took the name of Tarquin. He became the guardian of the children of King Ancus Marcius, and was chosen to succeed him on the throne. His reign was a glorious one. He waged successful war against the Latins, Sabines, and Etrurians, built the Roman sewers, which remain uninjured to this day, laid out the Circus Maximus and the Forum, and began the building of the capitol, and instituted the great Roman games. He was, however, murdered after a reign of thirty-eight years, through the influence of the sons of Ancus Marcius.

His son L. Tarquin the Proud, in 534 B. C., murdered the king, Servius Tullius, his father-in-law, and usurped the crown. He ruled ably, though tyrannically, and made Rome the acknowledged head of Latium. But his heavy taxes, and especially his persecution of the popular party, which had supported the former king, Servius Tullius, caused widespread discontent. At the same time a fearful omen encouraged his enemies; from the altar in the royal palace, a serpent crept forth and devoured the entrails of the victim. At last came the rape of Lucretia by the king's son Sextus. The senate deposed the tyrant, the army revolted against him, and he was forced to flee. Three attempts to reinstate him failed, and Tarquin's reign was followed by a republic at Rome. He died 495 B. C.

Tar'sus, a city of Asiatic Turkey, on the Cydnus, about ten miles from the Mediterranean. It is built of stone, and is surrounded by a rich country. There are mosques, caravanseries, and public baths. Wheat, barley, cotton, and gall nuts are exported. Tarsus is said to have been founded by Sardanapalus. Alexander captured it and it became a large and important city under the Romans. Tarsus is noted as the birthplace of St. Paul. Population about 20,000, former population 100,000.

Tartar'ic Ac'id is found in grapes, tamarinds, pineapples, and several other fruits, usually in combination with potassium. It is generally got from argol, which is produced during the fermentation of grapes. The acid is usually seen in the form of colorless, transparent crystals, which are soluble in water and alcohol. The crystals, when gently warmed, become strongly electric. Tartaric acid is largely used in calico printing and dyeing, for making lemonade, and in drinks and lozenges as a medicine. The acid potassium tartrate, called cream of tartar, is extensively employed as an ingredient of baking powders.

Tar'tars, in its widest sense, includes all the tribes living in the tablelands of central and northern Asia, who are not of Aryan blood, that is, the Tartars proper, the Kirghiz, the Kalmucks, the Manchu Tartars, the Mongols proper, and the Tunguslans. In a narrower sense, they comprise the Mongolian or Turanian people of Turkestan. These tribes are the wandering Kirghiz, the Uzbecks, who are the ruling class, the Kiptchaks, the Buddhist Kalmucks of eastern Turkestan, and many other tribes. In central Asia the words Turk and Tartar are used interchangeably to mean Mongolian. Tartar tribes, as distinct from Turks, formed the bulk of the great Mongolian migrations from the 4th to the 10th century, which planted the Tartar in southern Russia. Tartars and Turks made up the hordes which followed Genghis Khan and Timur.

Tar'tary, the name given formerly to a broad belt of territory reaching from the seas of Japan and Okhotsk to the Caspian or perhaps to the Don. Khiva was formerly called Independent Tartary; and the Crimea was called Little Tartary, and also Crim Tartary, from the name of the tribe which settled there in the 13th century. The name is applied now, if at all, to the Turkestan region.

Tashkend (*täsh-kend'*), a city of Russian Turkestan, on the Saralka river. It stands in a rich plain, and is surrounded by a wall 12 miles around, which is pierced by 12 gates. The houses of mud, thatched with reeds, are scattered among gardens and vineyards. A fortified castle, which is the home of the governor, mosques, colleges, old temples, and a bazaar are the chief buildings. Gunpowder, silk, cotton goods, and iron are manufactured. A large trade is carried on with Bokhara, Mongolia, and the Russian provinces of Orenburg and Petropavlovsk. Tashkend is an important military point and was long coveted by the Russians, who captured it in 1854. Population 156,506. See Vambery's *Travels in Central Asia.*

Tasmania (*tas-mā'ni-ä*), (formerly known as Van Diemen's land), is an island lying south of Victoria, Australia, and separated from it by Bass strait. The colony is a British possession and at the beginning of the century was a penal settlement. Transportation of criminals to it ceased in 1853. Its area is 26,385 square miles, with a population, in 1891, of 146,667. The aborigines of Tasmania are now entirely extinct. The capital is Hobart, situate on the south of the island, with a population of about 30,000. The other chief town is Launceston (population 20,000). The principal occupations are agriculture and stock-raising; wool, wheat, hay, and oats being the chief exports. Fruit is now being successfully cultivated, especially apples and pears, which in size, appearance, and in variety far surpass those of this country and Britain. The climate is healthy and temperate. The island is known to contain tin, coal, gold, and silver. Education is unsectarian and compulsory for all children between seven and fourteen. Government is exercised by a responsible ministry, with a parliament consisting of two chambers. A resident governor represents the crown. Population, in 1901, estimated at 160,000.

Tasso (*täs'o*), **Torquato** (*tor-kwä'to*), an Italian poet, was born at Sorrento, March 11, 1544. His father, also a poet, lived in exile, and Torquato was brought up by his mother, and went to school to the Jesuits till his tenth year, when he joined his father at Rome. He passed some years in study and in helping his father by copying and correcting, when he left for Padua to study law, where he wrote his first poem, *Rinaldo,* and, after a course of philosophy at Bologna, returned to become a

member of a literary academy established by one of his friends. While at the court of Alphonso II., duke of Ferrara, in 1575, Tasso finished his masterpiece, *Jerusalem Delivered*, but rashly sent it to a society of scholars, critics, and churchmen at Rome, instead of publishing it at once. Their criticisms drove him to madness. He believed he had been denounced to the Inquisition; and one evening in 1577 he drew his dagger to stab a servant, whom he fancied to be one of his secret enemies. He was imprisoned, but escaped to his birthplace, where he recovered his reason. Two visits to Ferrara were followed by two returns of madness, after one of which he suffered an imprisonment of seven years, being set free in 1586. In 1595, the excitement of his visiting Rome to be crowned a poet — the same honor which had been bestowed on Petrarch — caused an illness from which he died April 25 of the same year. See Milman's *Life of Torquato Tasso.*

Taste, the sense by which such properties of substance as sweet, sour, bitter, salt, etc., are distinguished. The principal organ of taste is the tongue, especially its sides, base, and tip. The soft palate and the arches of the palate have also the sense of taste. The sense of taste is weakened by any great change in temperature, either of heat or cold, as after holding the tongue in ice water, or in very hot water, the taste of sugar will not be noticed. It is necessary that bodies to be tasted should be dissolved, so as to come in contact with the nerves of taste. Any substance which will not dissolve in the fluids of the mouth will be found to be tasteless, and only recognized by the sense of touch in the tongue. Bitters and acids excite sensations of taste in the most diluted forms. One part of quinine in 1,000,000 parts of water can be easily distinguished from pure water. The sense of smell is affected by most substances as well as the sense of taste, and taste and smell together form what is called the "flavor." The great use of the sense of taste is to direct in the choice of food, and in the lower animals it is even a surer guide than in man. Usually articles that are agreeable to the taste are desirable for food.

Tattoo'ing, a widespread custom among savages of marking the skin with figures by means of slight cuts or punctures and a coloring matter. It is almost universal in the South Sea islands. New Zealanders cover often the whole face and sometimes the chest, arms, and other parts of the body with tattoo patterns. A boy is tattooed on entering manhood; the operation causes considerable pain, but is born unflinchingly. A bone, edged with teeth, is dipped in a thick mixture of charcoal and water, and hammered through the skin by means of a piece of wood. The marks last for life, and look black on a brown skin, but are dark blue on the skin of a European or American. Tattooing seems to have been common among the nations with whom the Jews came in contact, as they were forbidden to practice it. The Bedouin Arabs and many tribes of American Indians tattoo, and sailors all over the world print anchors and other marks on their arms.

Tauchnitz (*touch'nits*), **Karl Christoph Traug,** a famous German printer and bookseller was born at Grosspardau, near Leipsic, Germany, in 1761. Bred a printer, he began a small printing business of his own in Leipsic in 1796. Publishing and type-founding were added to it, and it became one of the largest establishments of the kind in Germany. In 1809, he began to issue classic works in such fine and cheap editions that they circulated throughout Europe. By offering a prize of a ducat for every error pointed out, he brought out a remarkably correct edition of Homer. In 1816, he introduced stereotyping into Germany, and applied it to music, an experiment which had not been tried before. The well-known Tauchnitz edition of English authors, which now numbers some 1,600 volumes, was begun in 1842 by his nephew. The elder Tauchnitz died in 1836.

Taun'ton, a city of Massachusetts, on the Taunton river, thirty-five miles south of Boston. The falls of the Taunton river furnish water-power for its many factories. Taunton has long been noted for its manufacture of brick and iron, and its copper works are the oldest and largest in the United States. Other products are locomotives, tacks, machinery, fire brick, crucibles, cotton, flannel, and silver-plated ware. The Taunton river is noted for its herring, shad, and alewife fishing. There is an academy, a public library, and the state insane asylum. Several ponds, many shade trees, and the "green" — a public square — help to beautify the place. Taunton was settled in 1638 by a company from Taunton, England. It became a city in 1864. The town site was known to the Indians as Cohannet. It was King Philip's favorite hunting ground, and during King Philip's war it was saved from attack by the king's friendship for one of the citizens. Population 31,036.

Tau'rus, a range of mountains in Asia Minor, which forms the water-shed between the waters flowing into the Mediterranean and those flowing into the Black sea. There are two divisions of the range, the Taurus on the south and the Anti-Taurus running northeast. Snow-covered mountain tops are numerous, rising above thick forests that everywhere mantle the mountain sides. The highest peak is Arjish Dagh in the Anti-Taurus range (13,100 feet). Other noted peaks are Bulghar Dagh (11,400 feet), Gok Dagh, and Ak Dagh, each 9,800 feet. The principal pass between Syria and Asia Minor, called in early times the Cilician Gates, is formed by the valley of the upper Cydnus.

Tax'es are levied on property and persons for the support of a government. In early times rulers often raised revenues by means of property owned by the government or crown, or belonging to the king or prince himself. The possessions of subjects were often confiscated outright, fines were imposed, and in Europe for many years crimes were punishable by the payment of a stated sum of money. The Jews paid taxes mainly in the form of the first fruits of their lands and the firstborn of their flocks, and it was the heavy burden of taxation that caused the revolt of the Ten Tribes after the death of Solomon. In Athens, a royalty on the products of the mines, import duties, market licenses, assessments on wealthy citizens, and tribute from dependent nations were some of the ways used for raising money. In Rome, under the republic, to the spoils of conquered nations and their tribute were added, under the empire, tolls, taxes on grain, on the privilege of Roman citizenship, etc. In Europe, under the feudal system, kings were supported by their own lands, and in war claimed the services of their barons and knights at their own expense. Venice, in the middle ages, began the modern system of taxation by taxing land and levying import duties; but throughout Europe, until the French Revolution, and in some cases since, the nobles and clergy were privileged classes and paid no taxes. In many countries of Asia the right of taxation was given or sold to governors of provinces or to the highest bidder, a practice which often resulted in wringing from the people all that they had, which caused widespread misery. In Europe, too, taxes were sometimes farmed out at a lump sum.

In the United States, taxes are imposed by the federal, state, and municipal governments. Federal taxes are in the form of customs duties on imports and excise duties, mainly on liquors and tobacco. Both import and excise duties are indirect taxes, that is, not paid directly by the consumer. The bulk of state taxes are laid directly on property. The heaviest taxes are usually those laid for local purposes by the county or city. Besides the ordinary city or county taxes, assessments are often made on property specially benefited, for opening streets or roads, for street lamps, sewers, water service, etc.

Unjust and unfair taxation has often caused discontent and even revolutions, and how to tax without oppressing the people is a deep problem. Turgot, the French statesman, called it the art of plucking the goose without making it cry. In most countries it is now recognized that no tax can be levied without the consent of the representatives of the people who have to pay it. It was England's attempt to raise a stamp duty and a customs duty on tea in America that caused the revolt of the colonies under the celebrated cry: "No taxation without representation."

Taxidermy (*tăx'i-der-mĭ*), the art of preparing the skins of animals for the purposes of the naturalist. In preparing small animals for stuffing, the skins are removed, the flesh clinging to them is cleaned away, and they are anointed with arsenical soap. This keeps the skin supple and prevents decay and attacks of insects. Larger skins are prepared with a powder containing arsenic, burnt alum, oak bark, and camphor. The animals are then stuffed and mounted.

Taxon'omy, that division of botany which deals with the classification of plants. It is one of the oldest of subjects, and not very long ago it was the only form of botanical instruction given in the schools. Specialists in this study are called "taxonomists" or "systematists," but the plant kingdom is so vast that no one can be a specialist in the taxonomy of all groups. Accordingly there are "algologists," who classify algæ; "mycologists," who classify fungi; "bryologists," who classify mosses; "pteridologists," who classify ferns. Ordinarily when a man is called a systematist or a taxonomist, without any qualification, he is a specialist in the classification of seed-plants. The early attempts to classify plants were purely artificial, that is there was no effort to indicate their real relationships. For example, one of the earliest groupings of seed-plants was into herbs, shrubs, and trees. This brought together many wholly unrelated plants and kept apart many which are closely related, just as unrelated words are brought together in a dictionary by the accident of their first letter. The artificial system was most highly developed by Linnæus, who invented an elaborate scheme on the basis or the number of stamens and pistils in the flower. This scheme was used until quite recently, but it has now been entirely replaced by natural systems. These systems attempt to group plants together which are really related, a "family" meaning about what the term means among human beings, if one substitutes species for individuals. A natural system of classification can only become perfect when the complete development and structure of every plant is known. Hence such systems are being constantly revised as knowledge increases.

Tay, the largest river of Scotland, pours into the German ocean a greater bulk of water than any river of Great Britain. The Dochart is the chief feeder of Loch Tay, and from this lake the Tay flows past Dunkeld and Perth, at the mouth of the Earn widening into the Firth of Tay, from three-fourths to a mile wide, and falling into the German ocean about ten miles below Dundee, after a course of 120 miles. It is navigable to Perth, and the tide flows a mile further up. The salmon fisheries of the Tay are valuable.

Tay'lor, Bayard, American author and traveler, was born at Kennett Square, Pa., in

1825. At seventeen, he was apprenticed in a printing office, and soon began to publish poems in newspapers and magazines. In 1844, he made a walking tour of Europe, an account of which he published as *Views Afoot*. After writing for several newspapers, he joined the editorial staff of the *New York Tribune*, in which paper appeared his accounts of his travels in California, Mexico, up the Nile, in Asia Minor, India, China, and Japan. In 1878, he became minister to Germany. Taylor was a quick worker, throwing off many volumes of verse, fiction, sketches, essays, translations, and criticisms, besides his eleven books of travel. Some of his best travesties are in his *Echo Club*. Among the finest of his poems are *Bedouin Song*, *The Quaker Widow*, and *The Old Pennsylvania Farmer*. His masterpiece is the translation of Goethe's *Faust*, "one of the glories of American literature." Perhaps the best of his novels is *The Story of Kennett*, which is largely his own story. Taylor died at Berlin, Dec. 19, 1878. See *Life*, by Conwell.

Tay'lor, Jeremy, a great English churchman, was born at Cambridge, Aug. 15, 1613. He was the son of a barber, and was graduated at Cambridge university, becoming a clergyman before he was twenty-one. During the Civil war he seems to have followed the royal army, and was afterward withdrawn to Wales. Here, buried from the world for thirteen years, he kept a school at Newton, and employed his leisure in writing the works which gave him fame. Chief among them are, *Liberty of Prophesying*, *Holy Living*, and *Holy Dying*. At the Restoration, Taylor, as a stanch Loyalist, was made bishop of Down and Connor, an Irish see. Seven years later, he died Aug. 13, 1667. See *Life*, by R. A. Wilmott.

Tay'lor, Zachary, twelfth President of the United States, was born in Orange county, Va., Sept. 24, 1784. His father was an officer of the Revolutionary war, and one of the first settlers of Louisville, Ky., where Zachary was taken as a boy and lived till his twenty-fourth year, working on a plantation and getting but little schooling. Taylor entered the army in 1808 as lieutenant, and in 1812, as captain of a company of fifty men, two-thirds of whom were down with fever, he defended Fort Harrison, on the Wabash, against a large force of Indians, led by the famous chief Tecumseh. Promoted to the rank of major for his gallantry, he was employed during the war in fighting the Indian allies of England. He built Fort Jesup in 1822, and ten years later served as colonel in the Black Hawk war. In 1836, he was ordered to Florida, where he gained an important victory over the Seminole Indians at Okechobee, for which he was appointed brigadier-general and made commander of the United States forces in Florida. Just before the breaking out of the Mexican war, in 1845, General Taylor was ordered to Corpus Christi, occupying the point with a force of 4,000. The next spring he marched across the disputed territory between the Nueces and the Rio Grande, and built Fort Brown, opposite Matamoras. The Mexicans demanded that he should retire beyond the Nueces, and on his refusal, General Arista crossed the Rio Grande with a force of 6,000. On May 8, General Taylor defeated him at Palo Alto with 2,300 men, and a few days later drove him from a new position at Resaca de la Palma across the Rio Grande. War was at once declared by congress; 50,000 volunteers were called for; and Taylor was made a major-general, re-enforced, and ordered to invade Mexico. On Sept. 9, with 6,625 men, he attacked Monterey, which was defended by 10,000 regular troops. After ten days' siege and three days' hard fighting, it surrendered. All but 5,000 volunteers and 500 regulars of his army were now sent to aid General Scott at Vera Cruz, and he was left with this small force to oppose President Santa Anna's army of 21,000. He took a strong position at Buena Vista, fought a desperate battle and won a decided victory. This victory against enormous odds caused the utmost enthusiasm, and General Taylor, known as "Old Rough and Ready," was nominated by the Whigs for the presidency and elected. Entering the White House in 1849, he found a Democratic majority in congress, with the small but vigorous Free Soil party holding the balance of power, while such exciting questions as the admission of California, the settlement of the boundaries of Texas, the organization of the newly-acquired Mexican territories, etc., were stirring the nation. Worn out by the unaccustomed turmoil of politics, the rough, good-natured old soldier did not long enjoy his honors, but died July 9, 1850, sixteen months after his inauguration. See *Lives*, by Fry, Montgomery, and Stoddard.

ZACHARY TAYLOR.

Tea, the prepared leaves of *Thea Chinensis*, or the drink made from them. The plant is probably native to India, and was introduced into China and Japan. In the intense tropical conditions in which the native plants grow, they become small trees; but in the colder climate of China and Japan they become bushy, with smaller and tougher leaves. The black and green teas are not derived from different plants, but are the results of the different methods of preparation. Enormous quantities of tea are produced in China, Japan, India, Ceylon, and Java, but most of it is used by the native populations.

Teach'ers' Institute, a gathering of public school teachers of a state or county. An institute is held yearly or oftener, and lasts usually from one to two weeks. Free instruction is given the teachers, by lectures, class drills, etc., in the best methods of teaching and governing schools. The members of the institute, as well as specially engaged lecturers, take part. Institutes have proved a valuable help to teachers, and have raised the standard of teaching throughout the country. The first institute was held by Henry Bernard, state superintendent of schools in Connecticut, in 1839.

Teak, the name of *Tectona grandis*, a member of the verbena family. It is a forest tree of India, and its timber is prized as by far the most serviceable of all timbers for ship-building. The timber resembles mahogany, and is more durable and much lighter than oak.

TEAK.

Teal, small ducks belonging to the group of river ducks. They are abundant in Europe, America, and most other parts of the world. There are ten or fifteen kinds in the United States. The two best-known forms are the green-winged and the blue-winged teals. The former is a beautiful little duck, about fourteen inches long, abundant during migrations, and one of the best ducks as food. They feed on seeds of grass, small acorns, fallen grapes, water insects, small snails, and worms. The blue-winged teal, with a blue band across the wings, is larger, being about sixteen inches long. It is the most numerous of the smaller ducks in the eastern United States. West of the Rocky mountains it is replaced by the cinnamon teal.

Tecumseh (*tē-kŭm'se*), a famous chief of the Shawnee Indians, was born near the site of Springfield, O., about 1768. His brother, the prophet Elskwatawa, preached against the use of the white man's liquor and food, and about 1805 Tecumseh tried to gather all the western Indians into a confederacy against the whites. As a result, 400 gathered at Greenville. In 1811, while the chief was away urging the Seminoles and Creeks to rebel, General Harrison marched on his encampment to demand that plunder should be given up and that the warriors should go back to their tribes. The prophet decided to fight, but was worsted and his prestige among the Indians destroyed in the battle of Tippecanoe. On the outbreak of the War of 1812, Tecumseh led a large force to the support of the British in Canada. He was made a brigadier-general in the English service, and fought bravely in several battles. He was twice wounded, at Maguaga and while bravely defending a ford on General Proctor's retreat before General Harrison. At the siege of Fort Meigs, where he and Proctor held joint command, he saved the lives of the American prisoners. At the battle of the Thames, in Canada, he believed he would be killed, so he laid aside his general's uniform and sword, and, dressed as an Indian warrior, fought desperately till he was shot down (Oct. 5, 1813). See *Life*, by Benjamin Drake.

Teeth are structures derived from the skin of the mouth, involving both the epidermis and the dermis. Those of vertebrated animals only need be considered. In fishes and snakes, they are usually sharp processes without sockets, arising from bones of the jaws and the mouth parts. In crocodiles and all mammals, they are located in sockets. The teeth always show the habits and food of animals, and, therefore, are much used by naturalists in classification. They are of great importance to the students of fossil life, because they are usually well preserved on account of their hardness. They have been of great service in tracing the evolution of animal life during geological periods. In the herb-eating animals, there have been slow changes in the pattern of the crown of molar teeth which can be read by students like hieroglyphics. The teeth of mammals contain living pulp on the inside provided with nerves and blood vessels; this is surrounded by dentine or ivory, a bony substance produced from the dermis. The dentine is covered above the jaws by enamel, which is the hardest substance in the human body. The roots are covered with cement which joins the enamel and sometimes extends into it. When the enamel is broken or worn through, the much softer dentine is exposed; this decays and leads to cavities in the teeth, and to their destruction, if the cavities are not cleaned and filled. The typical number of teeth in mammals is 44, 22 on each jaw, and not 32, as most people suppose, because the latter number is found in man. Teeth of mammals are divided into incisors, or cutting teeth, canines, or sharp tearing teeth, premolars which appear earliest, and molars, or grinding teeth. There are usually two sets which appear in succession, the milk teeth, or temporary ones, and the permanent set. The teeth are subject to great modifications. The great cutting teeth of beavers and the tusks of elephants are modified incisors, the tusks of the walrus, and those of the wild boar, are enlarged canines. The molars, or grinding teeth, have a pattern on the crown that is characteristic of the different groups of Mammals.

Tegner (*teg-nĕr'*), **Esai'as,** a popular Swedish poet, was born at Kyrkerud, Sweden, in 1782. He was graduated and appointed lecturer on æsthetics at the University of Lund. His poem, *Sweden*, which appeared in 1811, brought him widespread popularity. The next year he took charge of a parish, besides the chair of Greek in the university, and yet found time to write, among other works, *Axel*, a poetic romance, and his epic, *Frithiof's Saga*, which at once became the most popular poem of Sweden. Its author was at once made bishop of Wexio, sat in the national legislature in the chamber of the clergy, and became noted as a political leader and speaker. When just about to be appointed archbishop, Tegner had an attack of insanity, which he inherited. He recovered his sanity but not his health, and died in 1846. *Axel* and *Frithiof's Saga* have been finely translated into English verse by Longfellow.

Teheran (*teh-rän'*), capital of Persia, stands seventy miles south of the Caspian sea, on a wide stony plain. On the northeast are the Elburz mountains, the highest peak of which is Demavend, 22,000 feet above the sea. The town is built mainly of mud houses, packed within a mud wall twenty feet high and four miles around. The finest building is the bazaar of Taki Khan. In the suburbs is the shah's palace, called the ark or citadel, and the castle of the kajar's, another royal home. In 1849, a polytechnic school was opened with European professors, introducing science and the western languages. Carpets, shoes, hats, and linen goods are manufactured. Teherân was unimportant until made the capital of Persia by Aga Mohammed Khan about 1796. Population 250,000.

Tehuantepec (*ta-wän-tà-pĕk'*), an isthmus of Mexico, between the bay of Campeachy on the gulf of Mexico and the bay of Tehuantepec on the Pacific ocean. Its narrowest part is 130 miles wide. It contains some lakes and lagoons, and two rivers, the Coatzacoalcos and the Tehuantepec. One of the several plans to join the Atlantic and Pacific by a ship canal proposed crossing this peninsula in part, by deepening and widening the Coatzacoalcos river.

Tekeli, Emeric, Count, a celebrated Hungarian patriot, was born in Zips county, Hungary, in 1656. His father had taken part in a plot to free Hungary, and after his death, Tekeli was forced to flee to Poland. Unable to get possession of his estates, he invaded Hungary, when but twenty-two years old, at the head of 20,000 men, furnished by the prince of Transylvania. He was joined by crowds of his dissatisfied countrymen, made inroads into Austria, Styria, and Moravia, and forced the Austrian emperor, Leopold I., to make promises which gained over part of his followers. But Tekeli would not trust the emperor and refused to disarm. He was supported by the Turks, who crowned him king of Upper Hungary, and took part in the famous raid of Kara Mustapha into Austria. Soon many of his partisans deserted him and his friends, the Turks, imprisoned him, but again in 1690 he was at the head of a Turkish force with which he burst into Transylvania, routed the Austrians, and roused the Hungarians to renewed efforts for freedom. But several Austrian victories over the Turks forced them to sign a treaty agreeing no longer to support the Hungarian rebels. As a result, Count Tekeli was driven from the country for whose deliverance he had risked everything, and died at Constantinople in 1705. His wife, Helena, was a noted beauty, but more noted for her gallant defense of her castle, Mongatz, against an army of Austrians.

Tel'egraph, an instrument for transmitting signals to a distance. Unless otherwise specified the word is generally used to mean the electric telegraph, which is the only one we shall here discuss.

Electric signals appear first to have been transmitted on a commercial scale by Wheatstone and Cooke in England in 1837. At each end of the "line," which consisted of five insulated metallic wires, they placed five galvanometers. Different combinations of deflections to the right and left indicated different letters. (See GALVANOMETER.) Later a single galvanometer was used, different combinations of deflections indicating as before different letters. About the same time, 1837, Morse, in America, succeeded in perfecting a receiver in which the signals could not only be seen and heard, but were automatically recorded. This is the instrument which was in universal use in the United States until operators learned to read the message by the click of the instrument. Accordingly, for ordinary work a telegraph line is provided at each end with a *battery* for producing an electric current, a *key* for opening and closing the circuit, and a small electromagnet, with pivoted armature, the so-called *sounder* or *receiver*. More recently the Wheatstone bridge has been applied to the telegraph line in such a way that two messages may be sent over a line in opposite directions at the same time. This is called the *duplex telegraph*. Edison has invented a method for sending two messages over the same line in the same direction at the same time. This is known as the *diplex telegraph*. By combining these two, four simultaneous messages may be sent. This system is called the *quadruplex telegraph*. Various plans have been suggested for sending even more than four messages at once. This is called the *multiplex telegraph*. Rowland has recently (1900) perfected a system which will not only transmit six or eight simultaneous messages, but will deliver them printed on a typewriter; and not only so, but the sending

instrument of the Rowland telegraph is merely the ordinary keyboard of a typewriter. For details concerning these various systems and concerning the important subject of submarine telegraph, first worked out by Lord Kelvin, the student is referred to the larger treatises.

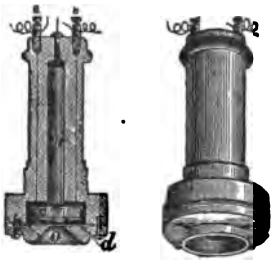
Telemachus (*te-lem'a-kus*), in Greek mythology, the son, by Penelope, of Odysseus or Ulysses, king of Ithaca, and hero in the Trojan war, who was noted for his exploits and wanderings. In search of his father, Telemachus, attended by Athene, in the guise of Mentor, goes to Pylos and elsewhere, endeavoring to find him. He at last discovers him, in the guise of a beggar, when Telemachus was lodging in the house of a shepherd. There is related to the king how his faithful wife, Penelope, is annoyed by innumerable suitors, and, returning to Ithaca, both father and son, aided by Athene (Minerva), succeed in slaying these suitors, after which the touching meeting takes place between Odysseus and Penelope. See under ULYSSES.

Telem'eter, an instrument for finding the distance of an inaccessible object. In military circles this instrument is generally called a "range finder." Nearly all telemeters are based upon one of two general principles, namely, (1) that the image of a distant object, produced by a lens, is geometrically similar to the object itself and depends for its size upon the distance of the object, or (2) that, having chosen a convenient base line of known length, it is possible by measuring the angle between this base and the direction of the distant object (first at one end of the base line and then at the other), to compute the distance of the object.

A very great variety of these instruments have been invented, some adapted to infantry in the field and therefore compact and less accurate, others adapted to naval operations in which much larger base lines and hence much greater accuracy can be obtained.

A similar process when employed by surveyors is called "stadia measurement."

Tel'ephone, an instrument for reproducing speech at a distance from its source. Perhaps the simplest solution of this problem is to connect two stretched membranes by a stretched string. The pulsations of the human voice near one membrane will set it into vibration; while the string will transmit these vibrations to the second membrane, which by its vibrations reproduces the original sound for a listening ear. This is the so-called "mechanical" or "acoustic" telephone; but it is limited to such short distances — less than a mile — that we shall not here discuss it.



BELL TELEPHONE.

The first electric telephone was undoubtedly invented by Philip Reis in Germany in 1861. To him we owe also the word "telephone."

Reis' instrument, like all others of this class, consisted of three parts, namely, one which transmitted the message, the "line" or wire over which the message was carried, and a "receiver" which finally transformed the message into sound waves for the listening ear. His transmitter was very simple, being merely a diaphragm carrying a metallic point which alternately made and broke an electric current when the diaphragm was set in vibration by the human voice. The line was an ordinary metallic wire. The receiver was an electro-magnet mounted on a sounding box. As the iron core of the magnet was alternately magnetized and demagnetized, it emitted a sound — the well-known "Page Effect," discovered by an American, Dr. Page, in 1837. In this manner Reis was able to transmit the proper *pitch* and *intensity;* but he was totally unable to convey the correct *quality*. (See ACOUSTICS for the three distinguishing features of a sound.) The proper method of transmitting the true quality of a note is the joint discovery of the late Elisha Gray and of Graham Bell.

The essential point in the solution — and, therefore, the essential discovery of these gentlemen — is the use of *continuous* electric currents instead of the *interrupted* ones employed by Reis.

The instrument which Bell patented and perfected, and which is in universal use to-day as a receiver, consists of a soft iron diaphragm, held by its periphery, in front of an electro-magnet. When an electric current, even a very minute one, is passed through the coil of the electro-magnet, the iron disk is attracted. If the current is a pulsating one, the disk is set into forced vibration, accurately following the variations of the current.

FIG. 1.

In figure 1 the diaphragm is shown at D and the electro-magnet at A. The line wires which convey the message to the receiver are attached at E.

For a transmitter, a microphone of the carbon type is almost universally employed. Two forms are in very common use: one, the Blake transmitter, is made up of a piece of gas carbon resting against a platinum pin; the other, devised by Hunning, consists of a layer of hard carbon granules. The accompanying diagram, figure 2, shows at D the diaphragm which is set in vibration by the human voice; between the carbon blocks, B and E, are placed the carbon granules which act as a microphone. See MICROPHONE.

As to telephone lines, their construction is essentially different from those of telegraph and elecric light lines. For this large subject, however, the reader is referred to a

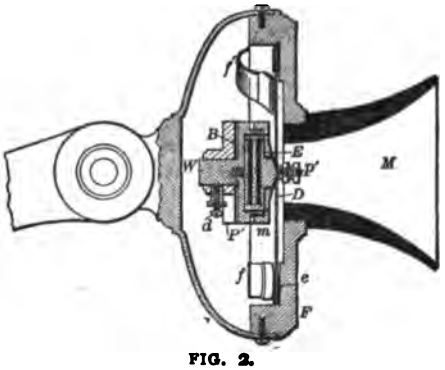


FIG. 2.

special treatise. The attention of the student is called, however, to the recent improvements introduced into submarine telephony by Professor Pupin of Columbia college. Hitherto the maximum working distance of the telephone for under-water lines has been about 25 miles. Dr. Pupin has succeeded in extending this to something like ten times the distance. For Pupin's account, see *Transactions of the American Institute of Electric Engineers*, Vol. XV. (1899) and succeeding volumes.

Telescope, an instrument for viewing distant objects, was invented, apparently, by Franz Lippershey, a Dutch spectacle maker at Middelburg, in 1608. Shortly after this date, Galileo heard of Lippershey's instrument and proceeded to make one for himself. It was with this instrument that he discovered four satellites of Jupiter, and the variable phases of Venus, thus completely establishing the heliocentric views of Copernicus.

The telescope employed by Galileo was essentially an opera glass, consisting of a small double concave (or negative) lens immediately in front of the eye, combined with a double convex (or positive) lens at some distance in front of the eye. See OPERA GLASS. But there are two reasons why the Galilean telescope is no longer used: (1) It has a very limited field, *i. e.*, no large extent of the object can be viewed with it at one time, and (2) One cannot use a micrometer eye-piece with it. See MICROMETER.

The telescope almost universally employed in modern times is the astronomical telescope which is made up of two converging lenses, as shown in Fig. 1. Let it be borne in mind that the purpose of the telescope is twofold. (1) To gather a large amount of light into a small bundle of rays, so that these can all enter the pupil of the eye, and thus make any luminous point appear much brighter than it would to the unaided eye, and (2) To magnify the angle subtended by two luminous points and thus make them appear farther apart than when seen by the naked eye. How this first

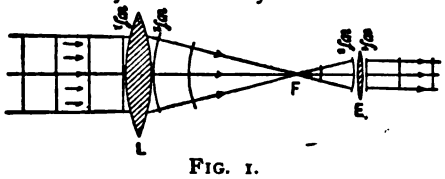


FIG. 1.

purpose is acomplished will be evident from Fig. 1., where wf_1 indicates the plane wave-front of the light coming from a distant star. The effect of the object lens, L, is to convert this parallel bundle, of rays into a conical bundle, having its apex, or focus, at F. The light leaving F is collected by the eye lens, E, and converted again into a parallel beam, wf_4, which is small enough, say $\frac{1}{2}$ of an inch, to enter the pupil of the eye. In this way nearly all the light which falls on the objective is made to enter the eye, making the star appear much brighter through the telescope than without it. How the second purpose of the telescope is accomplished will be clear from Fig. 2, which is the same as Fig. 1, except

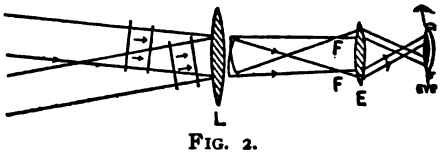


FIG. 2.

that it shows light coming from two distant stars, say a double star. Each star will send a beam of parallel rays to the objective, L. But the two beams of parallel rays which emerge from the eye lens make with each other a much larger angle than do the two beams of parallel rays which enter the objective. The telescope thus magnifies the angular distance between two stars. And since the human eye cannot distinguish two points as separate unless they subtend an angle of two minutes, the telescope enables us to recognize many stars as double when to the naked eye they appear as single.

The magnifying power of a telescope is numerically equal to the ratio of the diameters of the incident and emergent beams.

The best specimens of the astronomical telescope in existence are the 36-inch glass of the Lick observatory and the 40-inch glass of the Yerkes observatory, both made by the late Alvan G. Clark. On good nights these instruments permit the use of a magnifying power of from 2,000 to 3,000.

The reflecting telescope is little used and can therefore not be discussed within the limits of this article. Since, however, the reflector is interesting from a historical point of view, the student will do well to consult chapter vi. of Miss Clerke's *History of Astronomy*.

Teleutospore (*te-lū'to-spōr*), (in plants), a peculiar asexual spore which is developed

by the rusts, which are parasitic fungi. Wheat rust is a common example. The name refers to the fact that these spores are the last spores of the season which appear on the mycelium. As they must endure through the winter, they have very heavy walls, and hence they are usually very dark to completely black. Often they are called "winter spores." In the wheat rust, the teleutospores form the so-called "black rust" which appears on the stubble. See ÆCIDIOMYCETES.

Tell, William, according to Swiss story, was a patriot who in the 14th century rescued his native district from the tyranny of Austria. Albert I. of Austria was trying to annex the Waldstâdte, and was represented there by his bailiff, Gessler, whose rule was very cruel. Among other acts of tyranny, Gessler placed the ducal hat of Austria on top of a long pole in the market place of Altdorf, and gave orders that no one should pass without uncovering his head. Tell and his little boy one day took no notice of the hat and were dragged before the bailiff. Knowing Tell's reputation as a crossbowman, Gessler ordered him to shoot an apple from his son's head, and told him if he missed it he should die. To the wonder of all, he hit the apple without injuring the boy. But Gessler noticed a second arrow in the bowman's girdle and asked what he had meant to do with it. "To have shot you, had I killed my son," was the answer. He was at once seized, but escaped on his way to prison, and soon after shot Gessler through the heart. Then followed the great war of the Swiss against Austria, lasting from 1307 to 1499. Tell is said to have been drowned in 1350 while trying to save a friend during a great flood in the Schächen river. In 1387, Tell's chapel was built in his memory. How much of this famous story of Tell is true is not known. Schiller used the story in his *William Tell.*

Tel'ler, Henry Moore, United States senator, lawyer, and Republican politician, was born at Granger, Allegany county, N. Y., May 23, 1830, and educated at Rushford academy and Alfred university (LL.D. 1886). On studying law and being admitted to the bar, he practiced in Illinois, then removed to Colorado, where he was elected to the United States senate, and was secretary of the interior in President Arthur's cabinet (1882–85). Since 1885, he has continued to represent his state in the United States senate, but is now politically an Independent Silver Republican, having in 1896 withdrawn from the national Republican convention, at St. Louis, in that year in consequence of the financial plank in its platform adverse to free silver.

Tempe (*tem'pe*), **Vale of,** a narrow valley or gorge, about four and a half miles long, in the northeast of Thessaly, between Mount Olympus and Mount Ossa. The river Peneus flows through it. The classic poets praise it for its matchless beauty, and travelers to-day speak of the wild grandeur of its scenery.

Tem'perance. See TOTAL ABSTINENCE.

Tem'perature. The following statements, taken from Maxwell's classical volume on the *Theory of Heat,* put the matter as clearly and concisely as, perhaps, is possible.

"Definition of Temperature.— *The temperature of a body is its thermal state considered with reference to its power of communicating heat to other bodies.*

"Definition of Higher and Lower Temperature.— *If when two bodies are placed in thermal communication one of the bodies loses heat, and the other gains heat, that body which gives out heat is said to have a higher temperature than that which receives heat from it.*

"Corollary.— *If when two bodies are placed in thermal communication neither of them loses or gains heat, the two bodies are said to have equal temperatures or the same temperature.*

"Law of Equal Temperatures.— *Bodies whose temperatures are equal to that of the same body have themselves equal temperatures.*" See THERMOMETER.

Tem'plars, Knights, a celebrated religious and military order, founded at Jerusalem in the beginning of the 12th century by Hugues de Paganes, Geoffrey St. Omer, and seven other French knights, for the protection of the Holy Sepulchre and the pilgrims who visited it. Baldwin II., king of Jerusalem, gave them their first home; and another building was obtained from the abbot of the church and convent of the temple, because of which they were called Templars. Each Templar was allowed three horses and an esquire. They obeyed strict rules, and at first were proud of their poverty. When the Saracens captured Jerusalem, the Templars spread over Europe; their bravery became everywhere celebrated; money and lands were showered on them; and members of the greatest families were proud to be enrolled in their number. In every country where they were they had their governor, called the master of the temple.

The Templars at first were all laymen and of noble birth. Pope Alexander III., however, in 1162, had chaplains taken into the order, who did not adopt the military vows; and laymen not of noble birth afterward joined as serving brothers, some attending the knights and some working at trades in the houses and on the lands of the order. Many also joined merely to gain the protection afforded them. As the Templars grew in power they became luxurious, proud, and independent of law and authority. Philip IV., of France, seized and imprisoned all the members of the order on whom he could lay his hands, confiscated their lands, and put many of them to death for supposed crimes. The English Templars were treated by

Edward II. in much the same manner, except that their punishment was confined to the loss of their possessions to the king. In 1312, the order was finally suppressed by the council of Vienne, the greater part of their property being bestowed on the Knights of St. John.

The Templars' uniform was white, with a red maltese cross on the left shoulder. Their banner was white with black stripes, and was called *beauséant*, the name then given to a horse marked with black and white. Beauséant became also their battle cry. See Addison's *History of the Knights Templars*.

Ten'dril, an organ developed by many climbing plants as a holdfast. Tendrils may be modified branches, or leaves, or parts of leaves. In every case they are very sensitive, and have the power of rapid coiling or contraction when they come in contact with a support. In the grape vine, when the tendrils reach a support they coil about it, and growing unequally are thrown into spirals, thus drawing the vine toward the support. Sometimes a tendril has a sucker-like disk at its tip. When the disk becomes fastened to a support, the straight tendril becomes a spiral, and the plant is drawn toward the support. The stimulus which calls forth this response of the tendril is known as the "contact stimulus."

Ten'eriffe'. See CANARIES.

Teniers (*ten'yerz*), **David,** The Younger, was born at Antwerp in 1610. His father, also a well-known painter, gave him his first lessons in art. He soon showed a genius greater than his father's, but in the same line, as a colorist and painter of the scenes and incidents of ordinary country life. He became the most popular of Flemish painters, and was kept busy to meet the demand for his pictures. The governor of the Spanish Netherlands made him gentleman of his bedchamber, and the king of Spain set apart a special gallery for his works. In spite of the number of his paintings — over 1,000 — they bring very high prices. Among them are *The Village Wedding*, *The Bagpipe Player*, and *The Misers*. Teniers died near Brussels, April 25, 1690.

Ten'nessee', the third state admitted into the Union after the adoption of the constitution. Its greatest length is 432 miles, its greatest breadth 109 miles, and it covers 42,050 square miles. West Tennessee reaches from the Mississippi, the western boundary, to the Tennessee river; middle Tennessee stretches on eastward to the middle of the Cumberland plateau; and east Tennessee covers the rest of the state. The Mississippi bottoms, covering 1,000 square miles, are bordered on the east by a table-land covering 9,000 square miles and reaching to the Tennessee valley. In middle Tennessee, beyond the river valley, lies the garden of Tennessee, a rich plain of 5,450 square miles, like the bed of a drained lake, surrounded by a rim 300 feet high, filled with grain, cotton, and tobacco fields, and the largest red cedar forests in America. Eastward of the garden is the great Cumberland plateau, 1,000 feet above the Tennessee, rich in coal and limestone. The east Tennessee valley separates the plateau from the Alleghanies, a belt seven to 28 miles wide, including the Chilhowe, Great Smoky, Bald, and Unaka ranges. The highest peak is Clingman's Dome (6,660 feet). Among the Cumberland mountains are great caverns many miles long, in which are powerful underground streams and bones of extinct animals. Elsewhere in Tennessee are the mysterious sink holes, through which the waters drain down into the underground streams. The chief rivers are the Tennessee, which twice crosses the state, the Cumberland, the Holston, the French Broad, and the Big Hatchie.

The leading crops of the state are corn, tobacco, hay, wheat, cotton, oats, and potatoes. In tobacco Tennessee stood fifth among the states in 1889. Iron has begun to be largely mined, and the pig-iron product has greatly increased within the last ten years. The coal field covers 5,000 square miles of the Cumberland plateau. There are also lead and zinc mines, marble, kaolin, limestone, and granite quarries. Manufactures amount to over $75,000,000 yearly; cotton, wool, iron, and steel, cotton-seed oil, lumber, and leather are in the lead. The first railroad was the Memphis railroad, chartered in 1831, when there were only 50 miles in the country; in 1900 there were 3,189 miles, mostly built since the war.

In 1900, there was an attendance of 384,643 white children and 100,750 colored children in the public schools, making a total enrollment of 485,393. The University of Tennessee at Knoxville, opened in 1807; the University of Nashville, at Nashville; Grant university at Chattanooga; the University of the South at Sewanee; Vanderbilt university at Nashville, endowed with $1,000,000 by Commodore Vanderbilt; and Fisk university at Nashville, for colored students, are among the many colleges of Tennessee.

De Soto was probably the first white man to enter Tennessee. A settlement of North Carolinians, made in 1754, was broken up by the Indians. Two years later Fort London was built on the Tennessee, thirty miles from the site of Knoxville. The massacre of the garrison in 1760 was followed within a year by the defeat of the Indians and a treaty allowing settlements to be made. At first a territory of North Carolina, the dissatisfied frontiersmen organized the state of Franklin, which lasted from 1785 to 1788, when it was put down by North Carolina. Tennessee was admitted as a state in 1796. The different capitals have been Knoxville, Kingston, Murfreesboro, and Nashville, the present capital.

Tennessee seceded June 8, 1861, and was readmitted in 1866. Many of the hardest fought engagements of the war took place on Tennessee soil, as at Forts Henry and Donelson, Island No. 10, Murfreesboro, Chickamauga, Lookout Mountain, Franklin, and Nashville. Population 2,020,616. See J. B. Kellebrew's *The Resources of Tennessee.*

Ten'nessee', a river of Tennessee, is one of the largest branches of the Ohio, which it enters at Paducah, Ky. The Clinch and Holston rivers rise in southwest Virginia, and in eastern Tennessee unite to form the Tennessee river. The river flows first south, going 300 miles in Alabama, turns north, and crosses Tennessee and Kentucky. It is 800 miles to the junction of the two rivers at Kingston, Tenn., but 1,100 miles to the source of the Holston, its longest branch.

Ten'nyson, Alfred, an English poet, was born at Somersby, in Lincolnshire, England, in 1809. At Trinity college, Cambridge, where he studied, he gained a medal for a poem called *Timbuctoo.* His first publication, *Poems by Two Brothers*, was written in connection with his brother Charles, and so great an authority as Coleridge pronounced only the poems marked "C. T." to have marks of poetical genius. A volume containing the *May Queen*, *Mariana*, *A Dream of Fair Women*, and *The Lotus Eaters*, was followed by another collection which included, besides, *Locksley Hall*, *Morte d'Arthur*, *St. Simon Stylites*, and *Ulysses*, and from that time Tennyson easily held his place as the first of modern English poets. His great work, *In Memoriam*, is a series of poems on death, immortality, etc., suggested by the loss of his friend, Arthur Hallam. It was first published without Tennyson's name in 1850. The *Ode on the Death of the Duke of Wellington* and the *Charge of the Light Brigade*, one of his most popular poems, were written as poet-laureate, a position in which he succeeded Wordsworth in November, 1850. *Maud*, published in 1855, was longer in winning public favor than most of Tennyson's work, but the *Idylls of the King* met with an enthusiastic reception. The first series consists of four stories in verse, *Enid*, *Vivien*, *Elaine*, and *Guinevere*, to which a second series was added which included *The Holy Grail*, *Gareth and Lynette*, *Peleas and Etarre*, *The Last Tournament*, and *The Passing of Arthur.* They are the consummate form in which one of the greatest poets of the century has wrought those Arthurian legends which have been haunting English romance for 700 years; *Enoch Arden* appeared in 1864; *Queen Mary. a Drama*, in 1875; *Harold*, in 1876; *Becket*, in 1884; and *Demeter and other Poems*, in 1889. Tennyson lived a retired life, spending a large part of his time at his place on the Isle of Wight. He wrote carefully, altering and improving his poems, until they attained the perfect form in which they were given to the public. He received large sums of money for his later work, in some instances being paid as much as $50 a line. His poems have been translated into German and Spanish. In 1883, he was made a peer. He died at Aldworth, in Surrey, England, Oct: 6, 1892. One of his last poems, *The Crossing of the Bar*, was used in the services at his burial in the poets' corner of Westminster Abbey. See *Victorian Poets*, by Stedman; also *Tennyson, Ruskin, Mill, and other Literary Estimates*, by Frederic Harrison.

LORD TENNYSON.

Terence (*ter'ens*), **Publius Terentius Afer,** a Latin poet, was born at Carthage about 195 B. C. He was a freed slave, and was educated by his master, a Roman senator. His first play, the *Andria*, was brought out in 166 B. C., and was so successful that he had the best young men of Rome for friends. When in Greece he translated 108 of Menander's comedies, and his death is commonly thought to have been due to grief at the loss of his translations. He has left six comedies, *The Woman of Andros* (Andria), *The Stepmother*, *The Self Tormentor*, *The Eunuch*, *The Brothers*, and *Phormio.* The most popular is *The Eunuch.* They have been translated into most European languages. He died when only 36, in 159 B. C.

Terhune (*ter-hūn'*), **Mary Virginia,** American novelist, familiarly known by her pen name of "Marion Harland," was born in Amelia county, Va., Dec. 21, 1831. Her maiden name was Hawes, and in 1856 she married the Rev. Ed. Payson Terhune. At an early age she began to write for the magazines, conducting *The Home Maker*, *Babyhood*, and contributing to *Wide Awake* and *St. Nicholas.* Subsequently she resided in Massachusetts, but finally settled in New Jersey, where she has long been an untiring

"MARION HARLAND."

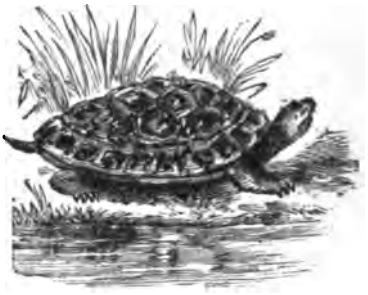
and helpful writer on themes connected with cooking, household management, etc. Among her works are, *The Story of Mary Washington*, *Alone*, *Moss Side*, *The Hidden Path*, *Common Sense in the Household*, *Common Sense in the Nursery*, *The Dinner Yearbook*, *The Cottage Kitchen*, *Breakfast, Luncheon, and Tea*, *Miriam*, *Helen Gardner's Wedding-day*, *Judith*, *Some Colonial Homesteads*, *At Last*, *Jessamine*, *Literary Hearthstones*, etc.

Tern, a water bird with forked tail, related to the gulls. These beautiful birds, usually with gray and white plumage, are common in harbors. They are most graceful birds, and it is to be regretted that of late years they have been killed in immense numbers for trimming ladies' hats. There are about fifty known species of terns. They are coast birds rather than open sea birds, like the gulls. The common tern, or sea swallow, is abundant on the Atlantic coast. It is about fifteen inches long. There is in the inland waters of North America a small black tern and a similar form in Europe.

Ter'ra Cot'ta, unglazed earthen ware, made of clay and hardened by burning. It is generally a dull red or buff in color. In England, the materials used are clay, fine quartz sand, and finely pulverized old pottery. It is used for statues, fonts, fountains, drain tiles, and ornaments for houses. The Greeks, Romans, Assyrians, and Babylonians made use of it, manufacturing molds, statuary, vases, and lamps. The articles were often ornamented with designs of men, animals, fruits, or flowers.

Terra del Fuego (*tĕr'ra del fwā'gō*), "Land of Fire," is a cluster of islands at the southern end of South America, with the straits of Magellan between them and the mainland. They are small, mountainous islands, with many peaks over 5,000 feet high, covered with perpetual snow, while the lower slopes bear forests of beech. The island proper is Terra del Fuego, 300 miles long. Cape Horn is the southern end of a small island of the group. The natives belong to the Patagonian race, build their cone-shaped huts of branches of trees stuck in the ground, with a hole for a door, dress in sealskins, and feed largely on shellfish. The climate is very variable, with storms, wind, rain, and snow in close succession. The islands were discovered by Magalhaes (Magellan) in 1520 and were named from the fires seen at night along the shores. They are nominally divided between the Argentine Republic and Chile.

Ter'rapin, the name broadly applied to small turtles belonging to a family of pond turtles (*Emydidæ*). It is frequently restricted to the salt-marsh terrapin, or diamond-back turtle, of the Atlantic coast which is highly prized as food. The region whence the diamond-back terrapin is chiefly taken is Maryland, although it is captured from New York to Texas. It is caught in great numbers in the summer and kept in pens for winter.



TERRAPIN.

It is about eight inches long; it swims well and runs well on land. The red-bellied terrapin, ranging from New York to Virginia, is often substituted for it, but the flesh of the latter is of inferior quality.

Terre Haute (*tĕr'e-hōt'*), Vigo county, Ind., is situated upon the east bank of the Wabash river on Fort Harrison prairie. It is seventy-three miles west of Indianapolis and almost equidistant (175 miles) from Cincinnati, Chicago, and St. Louis. The town was laid out in 1816 and has had a steady growth since, the population by the last census (1900) being 36,673. Its principal buildings are the Indiana State Normal school, with over 1,000 students, the Rose Polytechnic, and the Terre Haute high school, with 700 students. There are 20 public school buildings, two of which, recently built, are models, costing over $35,000 each, also two commercial colleges well attended. There are 180 teachers and about 7,000 children attending school.

There are several miles of paved streets and 15 miles of electric car line. The streets are well lighted by electricity, and many fine business blocks and private residences line the avenues.

The manufacture of glass is one of the principal industries. The great coal beds underneath furnish a quality of coal from which producer gas is made, which is cheaper and better than natural gas for manufacturing purposes. Among many other industries may be named rolling mills, stamping works, car shops, wagon, tool, brick, and tile works, hominy and flour mills, and several distilleries, which are among the largest in the country.

Ter'ry, Alfred Howe, an American soldier and general, was born at Hartford, Conn., Nov. 10, 1827, and died at New Haven, Conn., Dec. 16, 1890. After studying and practicing law he became colonel of a militia regiment in Connecticut, and on the outbreak of the Civil war his regiment was mustered into the United States service, and took part in the first battle

of Bull Run. Colonel Terry was present at the capture of Port Royal, at the siege of Fort Pulaski, and in the operations against Charleston. He was promoted to brigadier-general and shared in the capture of Fort Wagner, and acted in Virginia in 1864 as division and corps commander. He served at Drury's Bluff, at Bermuda Hundred, was at the siege of Petersburg, but his chief achievement as a soldier was his assault and capture of Fort Fisher (Jan. 15, 1865). After this he served under Sherman as corps commander and was at the capture of Wilmington. He was brevetted major-general in the regular army in 1865 and commanded the departments of Dakota and the south, and was in a charge of successful expeditions against Sitting Bull and the Sioux.

GEN. A. H. TERRY.

Ter'ry, Ellen (Alice) [Mrs. E. A. Wardell], an English actress, was born at Coventry, England, Feb. 27, 1848, and made her first appearance on the stage with Charles Kean's Shakespearean revivals, in 1858, in *The Winter's Tale*, and as "Prince Arthur" in *King John*. She subsequently joined a Bristol company, of which Mrs. Kendal was a member, and appeared in London in 1863 as "Gertrude" in *The Little Treasure*, as "Hero" in *Much Ado about Nothing*, and as "Mary Meredith" in *Our American Cousin*. After her marriage she retired from the stage for a while, but in 1867 reappeared, and later joined Mr. and Mrs. Bancroft's company, acting the part of "Portia," and touring with Sir Henry Irving as leading lady of his troupe. Her personations include "Viola" in *Twelfth Night*, "Ruth Meadows" in *Eugene Aram*, "Henrietta Maria" in *Charles I.*, "Marguerite" in W. G. Will's play of *Faust*, "Rosamonde" in *Becket*, "Lucy Ashton" in *Ravenswood*, "Lady Macbeth" in Shakespeare's tragedy of *Macbeth*, etc. In her repeated American tours she has won deserved praise, and is a welcome favorite of the modern stage.

ELLEN TERRY.

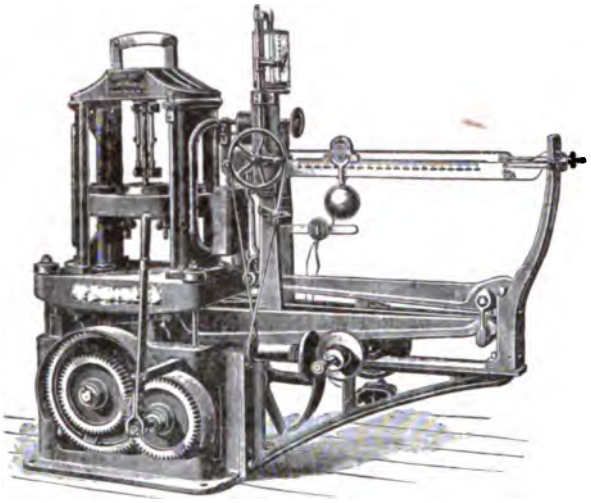
Tes'la, Nikola, electrician, physicist, and inventor, was born in Austria-Hungary in 1857, and studied at the polytechnic school at Gratz, the capital of Styria, and was for a time in the government telegraph engineering service, and in 1881 was employed at Paris in one of the large electric lighting companies of that city. In these employments he devoted himself to experiments in electricity and magnetism. On coming to the United States, in 1884, he was for a time in the Edison works at Orange, N. J., but afterward became electrician in the Tesla Electric Light company, and established at New York a laboratory for independent electrical research. He is the inventor of the modern principle of the rotary magnetic field embodied in the apparatus used in the transmission of power from Niagara Falls; also of new forms of dynamos, transformers, induction coils, condensers, arc, and incandescent lamps; and of the oscillator combining steam engine and dynamo. His researches in electrical oscillation have created a new field of electrical investigation; while he has made many startling innovations and inventions in using currents of high tension. He continues to be a resident of New York.

NIKOLA TESLA.

Tes'ta, the seed coat, which is usually hard and bony. The testa is developed by the tissue of the integument of the ovule. Sometimes it develops into two very distinct layers, an outer fleshy layer and an inner hard one. Often it is variously marked and sculptured on the surface, so as to enable one to recognize the plant from which it has come. In fact, the color and markings of the testa are very important guides in the classification of many plants. It is the testa also which develops the various tufts of hairs and wings often found on seeds, and which are aids to their dispersal by the wind. It sometimes develops hooks and spines, as grappling appendages, to aid in dispersal by animals.

Test'ing Machine, a machine for testing materials. Testing machines are arranged so as to apply measured forces to a sample of the material, and to observe the corresponding deformation or breaking of the sample. The common tests are stretching, crushing, bending, and tension. It is usual to apply the force either by a system of levers or by means of a hydraulic press. The forces are usually measured by a scale beam. When large samples are to be tested, such as long heavy beams, the machine must be very large. The

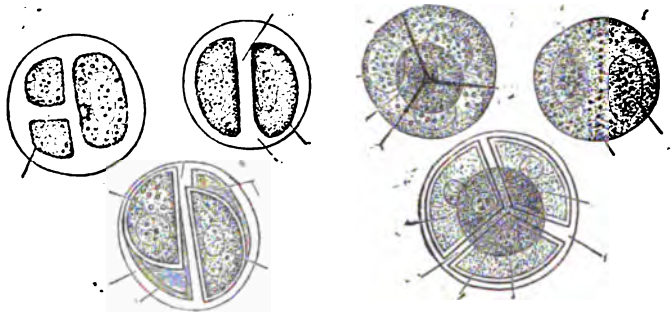
largest and finest testing machine ever constructed is that at the Watertown arsenal, belonging to the United States government. It can exert a force of 450 tons, and yet it is extremely sensitive. At the time of its trial, a rod of iron five inches in diameter was



AN AMERICAN TESTING MACHINE.

broken with a measured force of 722,000 pounds and immediately afterward a horse hair was broken with a measured force of one pound. For loads of 200 pounds it is sensitive to less than one two-millionth of the whole. Testing machines have so many special forms and appliances that special treatises must be consulted for details. See Unwin's *Materials of Construction.*

Tetrad (*tĕt'răd*) (in plants). In most of the higher plants each mother cell organizes four asexual spores within itself. This group of four is called a "tetrad." These four sister



A MOTHER CELL ORGANIZING WITHIN ITSELF FOUR SPORES (A TETRAD).

spores cling together for a time, and sometimes always, but generally they soon separate from one another. For example, if a very young anther be sectioned and examined under the microscope, each spore-bearing cell (mother cell) within it will be seen to contain just four forming pollen grains. This tetrad formation of asexual spores is almost without exception from mosses to seed plants.

Tet'raspore (in plants), the asexual spore of red algæ. It is so named because each sporangium produces just four pores. See RHODOPHYCEÆ.

Teu'tons, a tribe of ancient Germany, living on the Baltic sea. They were a powerful tribe, and with their neighbors, the Cimbri, invaded the Roman republic near the close of the 2d century B. C., and were almost destroyed by Marius (102 B. C.) The name is now given to all ancient German races.

Tex'as, the largest state in the Union, is four times as large as New England, larger than France, Germany, or Austria, and equal to six New Yorks or seven Ohios. Its greatest length is 825 miles; its greatest breadth is 740 miles; and it covers 265,780 square miles. If the whole population of the republic were to be carried to Texas, it would be no more densely settled than Massachusetts is now. Population 3,048,710. The coast is 375 miles long, in the shape of a crescent, fronted by lines of long islands of white sand, with the gulf of Mexico on one side, and on the other deep and navigable bayous and lagoons, reaching up among the cotton and sugar plantations. There are only four harbors with lighthouses in this long stretch of coast; the United States government has spent many millions in building jetties at Galveston, Sabine Pass, Aransas Pass, and other places. In the southwest, Padre island runs northward from the mouth of the Rio Grande for a hundred miles; and inside it (between Padre island and the Texas coast) is the Laguna de Madre, ninety miles long and eight miles wide. This lagoon is so salt that fish die on entering it, and on its shores lie the deposits which furnish most of the salt used in Texas. Most of the Texan rivers fall into the gulf of Mexico, among them the Rio Grande, Brazos, Colorado, Sabine, Trinity, Nueces, San Antonio, and Guadalupe. Three rivers form parts of the state line, the Rio Grande, Red, and Sabine. The main branch of the Rio Grande is the Pecos. Inland from the coast plains stretch the midlands, some 200 miles wide. The region called eastern Texas, from 96° to

Louisiana, covers 50,000 miles, with great forests of pine, oak, cypress, magnolia, etc., and with sugar, cotton, and stock farms. The rich black prairies reach from Laredo to Denison, a belt from thirty to sixty miles wide. Here wheat, cotton, and corn grow side by side. Western Texas lies between the Colorado and Nueces rivers, a bare rolling prairie of 50,000 square miles, mainly occupied by cattle and sheep ranches. Much like it is southwestern Texas, a tract of 30,000 square miles, between the Nueces, the Rio Grande, and the Rio Pecos. The Pan Handle lies between Indian territory and New Mexico, mainly north of Prairie-Dog-Town river, with 27,000 square miles of land. It is a plain from 2,500 to 4,000 feet high, with some good soil but little water. The staked plain, which enters from New Mexico, is a waterless, grassy table-land. Between the Rio Pecos and the Rio Grande are the Guadalupe, Charrote, and other mountains, in whose valleys the rivers die and vanish and the bitter salt lakes are the only water.

Two-thirds of the people are engaged in farming or ranching. Beef, cotton, wool, cotton seed, hides, corn, oats, wheat, and sugar are the chief products. Mining is mainly done in eastern Texas, where there is much iron ore. There are famous gold and silver mines beyond the Pecos, and coal, lignite, copper, salt, gypsum, soapstone, and marble are found. The manufactures of Texas are still young, but there are over 5,000 specified manufacturing industries reported, including cigar and tobacco factories, and grain and fruit distilleries. In 1900, Texas led all the states in the production of cotton.

The governor and other state officers are chosen every two years; the legislature is made up of the senate and house of representatives. The state capitol at Austin is the largest in the Union. The land office still controls 5,000,000 acres of public lands. Its school fund is worth $100,000,000, and in 1895 574,900 white children and 170,900 colored children attended the public schools. There are 112 high schools and academies, and several colleges, the most important being the University of Texas at Austin, which has an endowment of $5,000,000; Henry college at Campbell; Fort Worth university at Fort Worth; Baylor university at Waco, founded by the Baptists in 1845; and the Agricultural and Mechanical College of Texas at Bryan, endowed by the United States government. Texas had 400 miles of railroad in 1861; in 1900 the total mileage was 10,078. The chief cities of the state are San Antonio (population 53,321), Houston (population 44,633), Dallas (population 42,638), Galveston (population 37,789), and Fort Worth (population 26,688). Galveston, the chief seaport, was visited by a most destructive hurricane on Sept. 8, 1900. The loss of life entailed by the hurricane was close upon 3,000, while property to the value of about $25,000,000 was destroyed.

The Spaniards explored Texas at a very early date. La Salle in 1685 founded Fort St. Louis on the Lavaca river. But sickness and the Indian tomahawk blotted out the settlement, and the country was claimed and held by the Spaniards, who founded the missions of Dolores, San Antonio, and San Agostino. Indian raids and rebellions, followed by massacres, made Texas a desert, and to people it, Mexico invited American colonists in 1820, and within a few years 20,000 had settled there. The many annoying acts of the officials of Coahuila, of which Texas was a part, resulted in the Americans sending General Austin to ask that Texas be admitted as a state of the Mexican Union. He was thrown into prison, and troops sent to Texas. In 1835, the Texans rose in a mass, drove out the Mexicans after hard fighting, and proclaimed a republic. The cruel massacre of the garrison of the Alamo by President Santa Anna was followed by his overwhelming defeat at San Jacinto by General Houston. The independence of Texas was acknowledged by the United States in 1839. In 1845, it was annexed to the Union. At once there arose a dispute with Mexico over the southern boundary, Mexico claiming to the Nueces, the United States to the Rio Grande. The result of the Mexican war fixed the southern boundary at the Rio Grande, and the sale by Texas to the United States of lands to the north and west for $10,000,000 settled the detail of the state line as it is to-day. It was also given the right to divide into five states, if its future growth should require it. The state seceded in February, 1861, and was readmitted to the Union in 1870. The name Texas means "friends" and was that of the Indians first living there, whom the Spaniards called *Tejas* or *Tecas*. The nickname, "The Lone Star State," comes from the flag of the republic of Texas, a white ground with an azure star. See Bancroft's *History of Texas*.

Thack'eray, William Makepeace, was born at Calcutta in 1811. His father was in the civil service of the East India company, and dying young left his son a fortune of $100,000. When William was seven years old he was sent to England and placed in the noted Charterhouse school, often mentioned in his books. He next went to Cambridge, and in 1831 was at Weimar, where he saw Goethe. His ambition was to become an artist, and he traveled over most of Europe,

WILLIAM MAKEPEACE THACKERAY.

studying at Paris and at Rome. His drawings were quaint, picturesque, and truthful; his art may be seen in the illustrations of his novels, which, as he expressed it, were "illuminated by the author's own candles." However, his success in this line did not satisfy him and he tried his hand at writing, much to the delight of all English readers then and now. He first wrote for *Fraser's Magazine*, in which appeared *The Great Hoggarty Diamond* and *Barry Lyndon*. Most of his capital had been spent in foreign travel and losing investments; he now adopted literature as a profession. His *Snob Papers* and *Jeames's Diary* in *Punch* made him known, but his reputation as one of the greatest of English novelists was made by *Vanity Fair* (1846–48), which disputes the first place among English stories with such books as *Ivanhoe*, *Adam Bede*, *Tom Jones*, and *David Copperfield*. In 1849, he published *Pendennis*, one of the best of his books, which tells his own story. His lectures on *English Humorists* and on *The Four Georges* were delivered in America as well as in England. In 1852–55, appeared *Henry Esmond* and *The Newcomes*, which critics consider his finest works. In 1859, he became the first editor of *Cornhill Magazine*. Thackeray was tall and powerfully built, with massive head, and, as he aged, silvery white hair. He died at London, Dec. 24, 1863. See *Life*, by Trollope.

Thales (*thā'lēz*), Greek sage and philosopher, was born at Miletus, Asia Minor, about 640 B. C., and died about 546. One of the seven wise men of Greece, he was noted especially as an astronomer and geometer, and the earliest of the Ionian natural philosophers, regarding water as the principle of all things. A remarkable fact concerning Thales is his predicting, so early in the history of astronomical science, an eclipse of the sun, which is alleged to have occurred, May 28, 585 B. C., though doubted on the ground that, in Thales' era, certain astronomical facts necessary to predict an eclipse with any chance of success were not then known. Some modern astronomers have, however, stated that the prediction of Thales did come true on the date given, and the date agrees with that given by Pliny the Elder, in his *Natural History*.

Thallium (*thăl'li-um*), a metal discovered in London in 1861, by the use of the spectrum. It is found in certain iron and copper pyrites, of which it forms about a four-thousandth part, and some in mica. It is generally obtained from the fine dust of pyrites burners. It resembles lead in appearance, is very soft, can be hammered into leaves, tarnishes quickly, gives a green color to a flame, and forms many compounds.

Thallophytes (*thăl'lo-fits*), the lowest of the four great divisions of the plant kingdom. The name means "thallus plants," the thallus being the characteristic plant body, which is usually prostrate and has no differentiation of nutritive organs, as the roots, stems, and leaves of higher plants. All parts of this body are practically alike. There are two great general divisions of the group: (1) Algæ, which contain chlorophyll and hence can manufacture their own food and live independent of any other organisms; and (2) Fungi, which do not contain chlorophyll and hence are dependent upon other organisms for their food. Besides the ordinary algæ and fungi, the Thallophytes contain many forms which are not classified easily, as slime-moulds, bacteria, diatoms, etc. The group is an immense one, and contains the minutest of living forms, as well as some which are very bulky, as some of the seaweeds. Thallophytes are of special interest as representing the beginnings of the plant kingdom, the group from which all the higher forms have been derived.

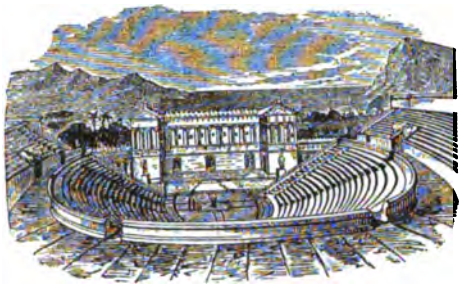
Thal'lus, the characteristic plant body of the Thallophytes, which see. The thallus body is also characteristic of the liverworts and of the gametophyte of ferns.

Thames (*temz*), a river of England rising in the Cotswold hills and flowing to the North sea. It is about 220 miles long, and as far as London, which is sixty miles from its mouth, is navigable for large vessels. It is eighteen miles wide at its mouth, and the tide flows up it for seventy-two miles. The largest river of England, it is also the most important, having as large a traffic probably as any river in the world. Its bridges and tunnels at London, its great docks and embankments, are a part of the sights of the city. Canals connect it with the Avon and the Severn rivers, the Sussex coast, and the canal system of central England.

Thanks'giving Day, a religious festival peculiar to the United States, resembling the Hebrew feast of ingathering. The Plymouth colony celebrated the first thanksgiving day after the harvest in 1621, four young men being sent out hunting to make provision for the feast. Such days were appointed after this at different intervals, and for various objects in New England and New York. Congress recommended a thanksgiving day yearly during the Revolutionary war, but from 1784–89, there was no national appointment of the festival. In 1784, a day of thanksgiving for the adoption of the constitution was recommended, and one in 1795, because of the suppression of a riot. For years the festival was almost exclusively a New England institution, celebrated by religious services in the churches, the sermon being often a political address, and by the gathering at the old home of the scattered members of the family. The day gradually became a custom in the western and some of the southern states, each state appointing its own day. During the Civil

war, proclamations for public thanksgiving were issued in 1862, 1863, and 1864, and since that time the day has been regularly appointed by the President of the United States. It is usually observed on the last Thursday in November.

The'atre. The first theatre in Greece, the birthplace of the drama, is said to have been



THEATRE OF SEGESTA, SICILY — RESTORED.

a wagon. The plays of Æschylus were represented on a wooden scaffold. About 500 B. C., one of these scaffolds gave way, and the inventive Athenians at once set about building the famous stone theatre of Dionysus. Like theatres were built in every Greek city and the ruins of many of them may be seen to-day. The largest is at Ephesus, and was 660 feet across. These theatres were built with seats in semi-circular rows rising one behind and above the other, and were often cut out of solid rock. In the center, at the lowest point, stood the orchestra, in front of the proscenium or stage, back of which was a solid wall, called the scene, ornamented with pillars and cornices. There was no roof, but an awning kept off the sun's rays, for the plays were always given in daytime. The Romans, who took from the Greeks the best of everything they had, built similar theatres of the greatest magnificence, besides their huge amphitheatres (which see). In both Athens and Rome the theatres were built large enough to seat almost all the citizens, who generally attended in a mass, at the expense of the government, for from the time of Pericles plays were made free to all. To enable these vast audiences of 80,000 to 100,000 or more to hear, the actors wore masks with mouthpieces which answered the purpose of speaking trumpets. Female characters were represented by boys, and it was not till the 17th century that actresses were allowed on the French and English stages. In the middle ages the miracles plays (which see) were played in cathedrals.

The modern theatre dates from the 16th century, the first ones being built at Vicenza and Venice. The famous Palais Royal at Paris was built by Cardinal Richelieu in 1639. The first English play house was the London theatre, built in 1576. About the same time were built the Curtain, Blackfriars, and Whitefriars. The first theatre in America was opened at Williamsburg, Va., in 1752. The largest and finest theatre in the world is the Grand Opera House of Paris. In China and Japan, every little village has its theatre. See DRAMA.

Thebes (*thēbz*), a celebrated Egyptian city, stands on the Nile, and was formerly the capital of upper Egypt. Its great ruins fill nine townships. The Nile flows through the city and divides it into four quarters. Thebes was at its height from 1500 to 1000 B. C., when it had supplanted Memphis, the ancient capital of the Pharaohs. This "City-of-a-Hundred-Gates," as Homer called it, sent out 20,000 war chariots, was filled with palaces and temples, and contained the cemeteries of the Theban monarchs. Later, the capital was moved to Sais, and Memphis, and the Persian Cambyses plundered it of $10,000,000. Alexandria was founded, and so its splendor departed. There are now only a few Arab families of Fellaheen, who gain a living by guiding travelers about the ruins or by selling articles rifled from the tombs. The ruins of Thebes are the most famous in Egypt. Among them are the temple of Karnak, a mass of obelisks, courts, and halls; the Memnonium, built by Rameses II., with a broken colossal statue, the largest in Egypt, of that king, weighing 887½ tons; the vocal statue of King Memnon, supposed in early times to make a sound at sunrise; the cemeteries of the sacred apes; and the Valley of the Tombs of the Queens. See Rawlinson's *Story of Ancient Egypt*.

Thebes, the chief city of Bœotia, in Greece, stood on a mountain slope between two streams in the southern part of the country. It is said to have been founded by a colony of Phœnicians under Cadmus, after whom the city was called Cadmea, a name afterward applied only to the citadel. Nothing certain is known of the place till its unsuccessful war with Athens in the 6th century B. C. During the Persian war Thebes sided with Xerxes against the other Greek cities, and for this desertion Athens wished to deprive it of its leadership of the Bœotian towns, but it was saved by the interference of jealous Sparta. It sided with Sparta in the Peloponnesian war, but soon afterward, fearful of Sparta's great power, befriended the Athenians, who fled from the oppression of the Thirty Tyrants, and sent a force of its citizens with Trasybulus and his fellow patriots to deliver Athens. Thebes became the formost power in Greece after the long war (379–362 B. C.) in which, under the leadership of Epaminondas, she triumphed over Sparta. Demosthenes induced Athens and Thebes to join hands against the encroachments of Philip of Macedon; but it was too late, and in 338 the battle of Chæronea crushed the liberties of Greece; a second rising was put down by Alexander, who razed Thebes to the ground, and sold the whole

body of citizens, men, women, and children, into slavery. Rebuilt in 315 by Cassander, it was destroyed by the Romans; was again a thriving town in the 11th and 12th centuries, but now has only about 5,000 inhabitants.

Theiss (*tīs*), an important branch of the Danube, and the chief river of Hungary, is formed by two streams, the Black Theiss and the White Theiss, in the Carpathian mountains on the borders of Galicia. It flows through a mountain pass, then in a zigzag course past Tokay and Szolnok, and for 300 miles is parallel with the Danube. It is navigable for large vessels to Szolnok, and is 828 miles long.

Themis (*thē'mis*), in Greek story, was the daughter of Uranos and Gæa (Heaven and Earth), the wife of Zeus, and mother of the hours and fates, and of equity, justice, and peace. In modern art Themis is represented as justice with her eyes bandaged, holding a pair of evenly balanced scales in one hand, with a sword in the other.

Themistocles (*the-mis'to-klēz*), a great Athenian general and statesman, was born about 514 B. C. In politics he became the rival of Aristides "The Just," who was ostracized in 483 B. C., leaving Themistocles the foremost citizen of Athens. To get ready for the coming Persian invasion Themistocles persuaded the Athenians to set apart the proceeds of the government silver mines for building a navy, believing that the only chance of victory was on the sea. The naval victories of Artemisium and Salamis (480) were won from the Persians chiefly through the efforts of Themistocles, though he allowed the standing claim of Sparta to the chief command, which was given to Eurybiades. The victory at Salamis (which see) raised his reputation to the highest point. But his popularity lasted only till 471, when he was ostracized for bribery. The rest of his life was spent at the Persian court of Artaxerxes, where he was greatly honored. See Fyffe's *Primer of Greek History*.

Theocritus (*thē-ŏk'ri-tus*), a famous Greek poet, a native of Syracuse, who flourished about 272 B. C. About the close of the reign of Ptolemy Soter, he visited Alexandria, where his first verses were written. Here Ptolemy Philadelphius became his patron, but later we find him back at the court of Hiero II., of Syracuse. For some reason he became dissatisfied with court life, and turning his attention to the scenes and life of the country, he wrote his thirty unexampled idyls of the everyday life of the Sicilian peasantry, which keep their charms of freshness and nature even to the present day. Besides the idyls, a few lines of a poem called *Berenice* and some epigrams are all that are left of his writings.

Theodoric (*thē-ŏd'ō-rik*), the founder of the kingdom of the Ostrogoths, which embraced Italy, Sicily, southeastern Gaul, Rætia, Noricum, Pannonia, and Dalmatia, was born on the Neusiedler sea, south of Vienna, in 455 A. D. His father, Theodemir, and two uncles had freed their nation from the yoke of the Huns on the death of Attila; part of the Goths had gone to Italy and Gaul, and Theodemir was left sole king of the Ostrogoths in Pannonia. Theodoric spent his boyhood as a hostage at the court of Constantinople, where he was brought up together with the emperor's children. After proving himself an able warrior, Theodoric become king of his people in 475. Two wars were now waged against the Emperor Zeno, who, to save his capital from the Ostrogoths, urged Theodoric to conquer Italy, then ruled by the usurper Odoacer. So in 488 the young king led the whole nation, some 200,000, across the Alps, won four pitched battles, shut up Odoacer in Ravenna, and after a three years' siege, captured both usurper and city. Once king of Italy, he governed the peninsula as well as it had ever been ruled under the Roman empire. He protected the Visigoths, checked the Franks, and gained Provence. Near the end of his prosperous reign a conspiracy was discovered in which his favorite, Boëthius, the philosopher, seemed to be mixed up. After the supposed traitor had been put to death, his innocence was proven, and Theodoric's remorse undoubtedly hastened his death in 526. See GOTHS.

Theodosius (*the-o-dō'-shi-us*) **I, the Great,** was of Spanish descent, and was born about 346 A. D. His father was the able general Theodosius, who freed South Britain from the Savage Caledonians. Theodosius accompanied his father in his British campaigns, but after his murder retired to his estate in Spain. From this retreat he was summoned by the emperor Gratianus, who made him his fellow-ruler, and intrusted him with the government of Thrace, Dacia, Macedonia, Egypt, and the east. Here he found himself face to face with the dreaded Goths, whom his army dared not confront in the open field, yet by bribes and promises he succeeded in making peace with them; and the magnificent funeral honors paid to their king, Athanaric, who died at Constantinople, so pleased the Goths that many served in his armies. On behalf of his brother-in-law, Valentinian II., he conquered the usurper Maximus, and in 392, when Valentinian was strangled by his general, Argobastes, Theodosius a second time marched on Rome, defeated Argobastes and became master of the whole Roman world. He had hardly won this vast power, when he died, at Milan, Jan. 17, 395.

Theophrastus (*thē-ō-fras'tus*), a Greek philosopher, born at Eresus, Lesbos, about 372 B. C. and died in 288 B. C. He was the disciple of and successor to Aristotle, and for thirty-five years presided over the Peripatetic school, or teaching and disputing school of logicians, who perambulated as they talked along the

walks of the Lyceum at Athens. Theophrastus was noted for his observational and scientific habits, and for his early contributions to botanical science. Though a member of the Platonic circle at Athens, he specially interested himself in researches about plant life, and has left us a *History of Plants* and the remains of a work dealing with the *Principles of Vegetable Life*. He also wrote a series of sketches of character, which have been taken as models by modern writers.

Theresa (*te-rē'sa*) or **Teresa** (*ta-rā'sā*), **St.,** was born at Avila, Spain, March 28, 1515. She was noted for her piety when a child, and when only seven years old, with her little brother she ran away from home to gain the crown of martyrdom among the Moors. She entered a Carmelite convent at twenty, and later founded the order of Barefooted Carmelites. Her reform had the support of the pope, and during her life twenty-nine convents of the reformed order were opened. Theresa was made a saint by Gregory XV., and her feast day is Oct. 15. Her letters and treatises, besides being considered by Catholics as among the most precious of their writings, have also gained a place among Spanish classics. St. Theresa died Oct. 4, 1582. See her *Life*, by Dalton.

Thermom'eter, an instrument for measuring temperature. See TEMPERATURE. There exists a great variety of thermometers based upon a great variety of principles But those which are most frequently used are dependent upon the fact that the volume of a fluid changes when its temperature changes. For ordinary temperatures, the most important thermometers are those which employ mercury or some gas (generally air or nitrogen) as the expanding fluid. For the measurement of high temperatures, see PYROMETER.

THE MERCURY THERMOMETER.

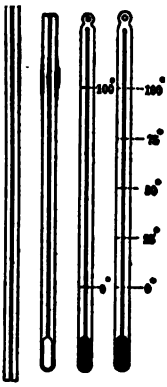
The principle of the mercury thermometer is that mercury when heated expands more than glass. If, therefore, a glass tube having a bulb blown at one end be partially filled with mercury and immersed in a bath at a higher temperature than its own, the mercury will rise in the tube. If the bath have a lower temperature the mercury will fall. And if the mercury neither rises nor falls we may fairly conclude that the mercury and the bath are each at the same temperature. The essential features of a good thermometer are the following:

1. It must be easily portable.
2. It must be permanent.
3. It must always give the same reading when subjected to the same temperature.
4. It must be possible for the user to test the correctness of its graduation, and to determine any errors in its graduation.
5. It must be relatively small, so that when placed in contact with a second body the temperature of the second body will not be seriously affected.

In making a thermometer which will satisfy these conditions, the peculiar advantages of mercury are:

1. It is easily prepared in a pure state.
2. It does not wet glass or stick to it.
3. It expands rapidly with changes of temperature, so that its changes in volume are easily read.
4. To each particular volume corresponds a definite temperature, which is not the case with water.
5. It does not freeze except at temperatures comparatively low, and does not boil except at temperatures comparatively high.

The accompanying figure illustrates the four principal steps in the manufacture of an ordinary mercury thermometer. First of all, a piece of thick-walled capillary tubing of uniform bore is selected; a bulb is then blown on one end of this tube, after which the bulb is filled with mercury. It is then highly heated and "sealed off." The last step is the graduation of the tube of the thermometer.



Showing four stages in the manufacture of a mercurial thermometer.

Now it happens that there are two temperatures which are easily reproduced in the laboratory. These are the temperatures of melting ice and boiling water. On the centigrade scale the first of these is called "0°" and the second "100°." The apparent change of volume between these two points is divided into 100 equal parts, each indicating *one degree.*

On the Fahrenheit scale the interval between melting ice and boiling water is divided into 180°, the lower temperature being called "32°" and the higher temperature "212°." For the *gas thermometer* the student is referred to Preston's *Theory of Heat*, Sec. II.

Thermopylæ (*ther-mŏp'i-lē*), a famous pass leading from northern to central Greece, between Mt. Œta and an impassable marsh on the edge of the Maliac gulf. The pass narrowed at each end to the width of a single wheel track, forming the eastern and western gates. Here the Spartan King Leonidas made his famous stand against the mighty army of Xerxes in 480 B. C. Learning that a Thessalian had betrayed to the Persians a path over the mountains to his rear, he sent away all his troops, which numbered some 7,000, except 300 Spartans, 700 Thespians, and 400 Thebans. This chosen band made a sally and perished to a man. Only one Spartan, who was too sick to fight, escaped, only to meet the scorn of his countrymen on his return home.

Thermotropism (*thĕr-mŏt'ro-pĭz'm*), the sensitiveness of a plant to heat coming from one side, in response to which the rate of growth is so unequally affected as to cause the part to bend toward or away from the source of heat, *e. g.*, corn seedlings and hyacinth leaves bend toward a warm iron plate (30°C.) placed near them; cress seedlings turn away from it. See IRRITABILITY and GROWTH.

Theseus (*thē'sē-us*), a famous Greek hero, said to have been the son of Ægeus, king of Athens. His most noted exploit was his offering himself as one of the youths yearly delivered to the Cretan Minotaur, for the purpose of killing that monster. Ariadne, daughter of King Miros of Crete, fell in love with him and gave him a sword and a clue of thread with which he killed the Minotaur and escaped from the famous Labyrinth. The fatal ship which carried the tribute youths, always carried black sails, and Theseus had promised his father to hoist white sails if he was successful in his undertaking. This was forgotten, and the king, thinking his son killed, threw himself into the sea. Theseus was now king. He is said to have waged war against the Amazons and the Centaurs, to have been one of the Argonauts, to have taken part in the Calydonian hunt, and to have carried off Helen from Sparta when she was only nine years old. For this he was attacked by Castor and Pollux, was driven from his throne by a revolt of the Athenians, and was killed by treachery.

Thes'saloni'ca. See SALONI'CA.

Thes'saly, the largest state of ancient Greece, reaching from Thermopylæ to the Cambunian mountains, and from Mt. Pindus to the Ægean sea. But often the name was applied only to the Thessalian plain, which was surrounded by mountains, and was the most fertile part of Greece. The plain was divided into two parts, Upper Thessaly, the chief city of which was Pharsalus, and Lower Thessaly, having as its main city, Larissa. The Thessalians were said to have emigrated from Epirus. There were three classes in the country, the rich land owners, Achæans and other conquered tribes, and serfs, who were probably the first dwellers in the land. In early times wars were carried on with the Phocians. About 400 B. C., under the tyrants Lycophron, Jason, and Alexander, Pheræ became the foremost city and brought all Thessaly under its rule. Thessaly fell successively into the hands of the Macedonians, Romans, and Turks. A part of it now belongs to Greece. See Grote's *History of Greece*, and Fyffe's *Primer of Greek History*.

The'tis. See ACHIL'LES.

The West'ern, a college for women located at Oxford, O., was established in 1853 as "The Western Female Seminary." In 1894, the name was changed to "The Western," a college and seminary for women.

Thiers (*te-ĕr'*), **Louis Adolphe,** a French statesman, was born at Marseilles, April 16, 1797, the son of a locksmith. After attending the lyceum at Marseilles, he studied law at Aix. He then went to Paris to seek his fortune, and after a hard struggle with poverty, became a newspaper writer and was soon widely known. But it was his popular *History of the French Revolution* which carried him from his garret in an out of the way alley to fame, both as a writer and in politics. In 1830, he established a new democratic paper, *The National*, which greatly helped to bring about the revolution of 1830. Thiers at once became one of the ablest debaters in the chamber of deputies. He was minister of the interior in 1832, later, was minister of commerce and agriculture, and in 1836, prime minister. A disagreement with the king, in regard to the fortification of Paris, led to his resignation and gave him the opportunity to begin his *History of the Consulate and of the Empire*, adding to his material by visiting England and personally inspecting the battlefields of Germany, Italy, and Spain. He was still an acknowledged leader in politics, and protested against French union with England in her objections to the annexation of Texas, being unwilling, he said, to act against "the great American nation, the harbinger of French liberty." After the revolution of 1848, he became prominent in the assembly, supporting Louis Napoleon as president, but warning the nation in vain of the danger of a new empire, thus causing his imprisonment and exile at its establishment. His return to the assembly was marked by his great speech against the enormous outlay in the Italian war and the expedition to Mexico, and in improving the city. In 1870, he prophesied defeat in the Prussian war, and, as chief of the executive, was successful in procuring a treaty of peace, in crushing the commune, and in carrying out a national loan for paying the German indemnity. He was given the title of president, Aug. 31, 1871, and succeeded in obtaining the withdrawal of German troops from French soil, but resigned in 1872. He was gathering material for a history of art, and was writing his memoirs, when he died, near Paris, Sept. 3, 1877.

LOUIS ADOLPHE THIERS.

Thirty Years' War (1618–48), a terrible continental struggle in Central Europe, partly religious, and partly political, which involved

Germany and Austria, Bohemia, Denmark, Sweden, and France. The war had its origin in 1618 in Bohemia, which from being an elective monarchy, and since the days of Huss and Jerome of Prague strongly Protestant, had come into the possession of the Catholic house of Austria, which ruled it despotically. In 1609, Rudolph, king of Bohemia, and son of the emperor Maximilian II., was forced, though under the influence of the court of Spain, to grant religious freedom to the Bohemian Protestants; but having in 1611 been intrigued against by his brother Matthias and displaced by him from the throne, the latter violated the concession made by Rudolph, and the Bohemians retorted by throwing the imperial commissioners out of a window in the Hall of Regents and insisted on their rights as Protestants and proceeded to fight for their religious privileges. The forces then arrayed against Protestantism were those of the House of Austria, which feared to lose its territories by the conflict impending, and those of the Catholic league, at whose head was the duke of Bavaria, and whose country was in the war that followed ravaged by the Swedes and French. In 1619, the emperor Matthias died, and was succeeded by Ferdinand II; him, however, the Bohemians would not accept, but chose a rival in the person of Frederick V., elector of the Palatinate, son-in-law of James I. of England. This action dispelled all hope of reconciliation between Bohemia and Austria, and the war, aided by the duke of Savoy, was proceeded with under Thurn and Mansfield; but though Bohemia at first met with some successes, its forces were hard pressed by those under Count Tilly, who commanded the troops of the Catholic league, and who, in November, 1620, met the elector's army at White Mountain, outside the walls of Prague, and there defeated and routed it, the elector barely escaping capture. Frederick, though he found refuge at The Hague, was deposed and lost his dominions; but Mansfield and the Protestant party in Bohemia continued the war; which was now (1625) joined by Christian IV. of Denmark, who became for the time leader of the Protestant rising in northern Germany. He, however, met with defeat at the hands of Count Tilly at Lutter, in Brunswick (Aug. 27, 1626); Mansfield also suffering defeat, in the previous April, by the imperialist general, Wallenstein, at the bridge of Dessau, in Anhalt. After this the whole of Silesia was dominated by the forces of the league, while Tilly and Wallenstein, joining their armies, pursued the Danes to the far north; and presently the whole of Schleswig and Jutland, save a few fortified towns, fell into their hands. Of these, the northern seaports of Stralsund and Glückstadt heroically held out against their Catholic besiegers; but Denmark, having had enough of the war, concluded with Ferdinand II. the peace of Lübeck (May 22, 1629), Christian receiving back all his hereditary possessions and resigning all claim to the bishopric, held by his family within the empire. In the following year, Wallenstein was dismissed by his master, owing to repugnance at the excesses of his soldiery, complained of at a meeting of the electors of the empire at Ratisbon.

At this juncture, a new period of the Thirty Years' war is entered upon, by the intervention of Sweden and the appearance on the scene of the great Swedish king and soldier, Gustavus Adolphus, of the royal house of Vasa. Gustavus at this time had just concluded an armistice with Poland, through the mediation of Richelieu, and being loyal to the principles of the Reformation, he ardently intervened in the struggle between Catholicism and Protestantism. Unfortunately his career was a short one, for he fell at Lützen (Nov. 16, 1632), though not before his Swedes were victorious over Wallenstein (who had been reinstated in command), and he had beaten Tilly at Breitenfeld, with frightful loss to the Austrians. Despite the death of the Swedish king, the war went on, Bernhard of Weimar, the companion of Gustavus, leading the Protestants, and Wallenstein commanding the imperial troops. With the religious objects of Ferdinand II. and the Catholic league, Wallenstein, however, had little sympathy; his object was rather that of selfish aggrandizement. Seeing that to be the case, a conspiracy was formed against him, which led to his assassination, inspired by Spanish gold. This occurred Feb. 25, 1634, and Wallenstein's removal marks a turning point in the war, for it now ceased to be a purely German and Protestant struggle. "In the course of years the German contest had come to involve in itself all the rivalries and enmities which then agitated Europe; the quarrels of Sweden and Poland, the jealousy of Denmark against its northern neighbor, the struggle of Spain to reduce the Dutch into subjection; and, above all, the enmity between France and Spain, which dated back to the time of Charles V. It was these foreign interests that prolonged the war for the next thirteen years."

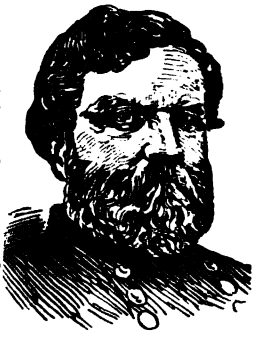
At this juncture, France comes upon the scene; and, curiously enough, we find her taking the side of the Protestant powers of Germany, at the very period when she was persecuting her own Protestant subjects. The reason of this, however, was not only her desire to crush the power of the house of Hapsburg, ascendant then in both Spain and Austria; but among other objects to secure possession of Alsace and Lorraine for France and the empire. This was the motive and ambition of Richelieu, who coveted the Rhine provinces. Meanwhile, though the war had been maintained in the Protestant interest by Bernhard of Saxe-Weimar, the latter met with a sanguinary defeat (Aug. 27, 1634) at Nördlingen, in Bavaria; and by the following spring the whole of south Germany was in the hands of the Imperialists. In spite of

this check, Bernard and the Swedes continued the struggle, and four years later he defeated the Imperialists at Rheinfelden, and captured Breisach. While these events were happening, Ferdinand II. died and was succeeded by Ferdinand III. who pursued the same ultramontane policy; and Bernhard himself also died, at Neuenburg, on the Rhine (July 18, 1639). France and Sweden, meanwhile, prosecuted the terms of their alliance, the French invading the Spanish Netherlands; while the Dutch destroyed a Spanish fleet, and Portugal, taking advantage of an insurrection in Spain, regained her independence. The end now came in sight, for France on the Rhine had at the head of her armies the great fighters, Condé and Turenne, and Mazarin had succeeded Richelieu as French prime minister. Condé defeated the Spanish at Rocroi, near the Belgian frontier, and at Allerheim, near to Nördlingen, he routed the Imperialists, under the Bavarian field-marshal, Baron Mercy, who was killed (Aug. 3, 1645). Turenne, on the other hand, effecting a junction with the Swedish army, with it invaded Bavaria and overthrew Maximilian, who had been one of the chief organizers of the Catholic League. The war terminated with the peace of Westphalia (Oct. 24, 1648), and the occupation by the Protestant army of Prague, where the struggle had had its commencement. The gains of the war fell chiefly to France and Sweden; while Lutherans, Calvinists, and Catholics alike were accorded religious freedom. Calamitous were the burdens of the struggle to Germany. G. M. A.

Thistle (*this'l*), the name of species of certain genera of the composite family, popularly characterized by being stout and spiny. The genus to which the common thistles belong is *Cnicus*. Some of them are among our worst weeds, and their seed-like fruits (akenes) with plumy tufts of soft hairs, are wafted everywhere on currents of air. The well-known Canada thistle (*C. arvensis*) is wrongly named, as it is a noxious weed from Europe.

Thom'as a Kem'pis. See KEMPIS.

Thom'as, George Henry, an American general, was born in Southampton county Va., July 31, 1816. After studying at West Point and seeing service in the Mexican and Seminole wars, he was appointed a professor at West Point. For six years he was in service in California and Texas. He began during the Civil war as a cavalry colonel in the Shenandoah valley. As commander of a division of the army of the Ohio, and afterward of a corps in the army of the Cumberland, he fought in Alabama, Tennessee, and Kentucky under Grant. In Rosecrans' campaign he was at the battle of Murfreesboro, and at Chickamauga saved the Union army from destruction. He was made a major-general of volunteers in 1862, and in 1863 brigadier-general of the regular army and put in command of the army of the Cumberland. His army decided the battle of Missionary Ridge. The army of the Cumberland, under Thomas, was in constant service in Sherman's Atlanta compaign, and in October, 1864, it was sent to Nashville to drive back General Hood, who was defeated at Nashville, Dec. 16, 1864. This service was rewarded with the rank of major-general in the regular army, and a gold medal from the state of Tennessee. After the war, General Thomas was in charge of several military districts. He declined the rank of lieutenant-general which was offered him, saying he had done nothing since the war to merit promotion. He died at San Francisco, March 28, 1870.



GEN. G. H. THOMAS.

Thom'as, Saint, one of the twelve disciples of Christ, is rarely mentioned in the New Testament. He is called "doubting Thomas," as he refused to believe in the resurrection of Jesus until he had seen and touched him. According to various accounts he preached either in Parthia, Egypt, Ethiopia, or India.

Thom'as, Theodore, American orchestra leader, and conductor of the Chicago orchestra, was born at Esens, Hanover, Germany, Oct. 11, 1835, and came to the United States as a youth ten years later. He studied music assiduously and made his début as a solo violinist, afterward taking part in concerts and on tours in various parts of the country. In 1864, he inaugurated orchestral concerts, and three years later organized the Thomas orchestra. He subsequently became conductor of the Brooklyn and of the New York Philharmonic societies, and on his removal in 1891 to Chicago, he became conductor there of an orchestra, and was musical director of the World's Columbian exposition. He has conducted notable musical festivals at Cincinnati, in successive years, as well as at New York and Chicago, and has done much to further the interest of music in America and develop public taste for it.

Thomp'son, Sir **Benjamin,** better known as Count Rumford, a brilliant engineer, statesman, and soldier, born at Woburn, in Massachusetts, 1753; died at Auteuil, a suburb of Paris, in 1814. He appears to have been well educated in spite of the fact that he was largely self-educated. Being an English sympathizer, he went to England at the outbreak of the American Revolution. Here he

was rapidly advanced in the state department. In 1779, he was elected fellow of the Royal society. At the invitation of a Bavarian prince, he went to Munich in 1783, where he remained for the next eleven years as minister of war and minister of police. During this period, while superintending the construction of cannon at the arsenal, he made a series of experiments which led him to think that heat was not an imponderable fluid, but a form of energy. He is therefore justly called one of the founders of the mechanical theory of heat. While at Munich he was made Count Rumford. He and Sir Joseph Banks took part in the establishment of the Royal institution in London. Rumford's second wife was the widow of the distinguished chemist, Lavoisier.

Thomp'son, Joseph Parrish, an American clergyman, was born at Philadelphia, Aug. 7, 1819. He studied at Yale college and Andover seminary, and was pastor of Congregational churches at New Haven and New York. In New Haven he helped to found the *New Englander*, a Congregational periodical, and also the *Independent*, a New York religious weekly. He gave much time to oriental studies, after his visits in Palestine and Egypt, and contributed the results in magazine articles. He published a large number of religious works, as *Life of Christ*, *Man in Genesis and Geology*, *The Holy Comforter*, and several memoirs. He died at Berlin, Sept. 20, 1879.

Thomp'son, Launt, an American sculptor, was born in Ireland in 1833, but was brought up in Albany, N. Y. He was nine years in Palmer's studio in Albany, where his bust of *Little Nell* made him well known. A statue of General Winfield Scott, at the soldiers' home near Washington, a soldier's monument at Pittsfield, Mass., a colossal statue of Napoleon, and a statue of the first president of Yale, on the college grounds, are some of his larger works. He died at Middletown, N. Y., Sept. 26, 1894.

Thomp'son, Richard Wigginton, an American politician and ex-secretary of the United States navy, was born in Culpeper county, Va., June 9, 1809, and died at Terre Haute, Ind., Feb. 9, 1900. When a young man he was a clerk in Louisville, Ky., but afterward moved to Lawrence county, Ind., where he studied law and was admitted to the bar. In 1834, he became member of the state legislature and later of the senate, acting for a time as president of the senate and lieutenant-governor. In 1841, he was returned member for congress, serving for several terms, and for a time was judge of the fifth Indiana circuit. In 1877, he entered Hayes' cabinet as secretary of the navy, and became chairman of the American committee of the Panama Canal company. He is the author of a *History of the Tariff*, *The Papacy and the Civil Power*, *Footprints of the Jesuits*, and *Personal Recollections of Sixteen Presidents*.

Thom'son, James, a British poet, was born in Roxburghshire, Scotland, Sept. 11, 1700. He studied six years at Edinburgh. His fame rests upon his poems on the seasons, the first of which, *Winter*, appeared in 1726, followed by *Summer*, *Spring*, and *Autumn*. He wrote several dramas, *Agamemnon*, *Edward, and Eleonora*, and *Tancred and Sigismunda*. The *Castle of Indolence*, next to the *Seasons* his best-known work, was written in 1748. The song *Rule Britannia* is found in a masque, *Alfred*, written by Thomson in connection with Mallet. He died near Richmond, England, Aug. 27, 1748.

Thom'son, Joseph John, a brilliant young English physicist, who has occupied since 1884 the most important chair of physics in Great Britain, namely, that of *Experimental Physics* at Cambridge university. He was born near Manchester, Dec. 18, 1856; was educated at Owens college and at Trinity college, Cambridge, where he graduated Second Wrangler, and Second Smith's Prizeman in 1880. His work has all been of a very profound character. Aside from numerous contributions to periodical literature, the following list of works will give some idea of his prodigious activity. *Treatise on Vortex Motion*, 1884; *Application of Dynamics to Physics and Chemistry*, 1896; *Recent Researches in Electricity and Magnetism*, 1892. His most recent (1899) achievement is the division of the hydrogen atom. By a very clear and logically connected series of experiments, he has succeeded in splitting off from the hydrogen atom a small part, which he calls a "corpuscle," and which has a mass of only one-thousandth of that of the hydrogen atom. For a popular account of this work, see the *Astrophysical Journal*, Vol. XI., pp. 170–4 (1900).

Thom'son, Sir William. See KELVIN, LORD.

Thor (*thôr* or *tor*), in Scandinavian myth, was the oldest son of Odin and Frigga, and was the god of thunder. He ruled winds, seasons, and agriculture. The *Eddas* speak of him as the champion of gods and men, hurling his thunderbolts at his enemies, the monsters and giants. His weapon was an enormous hammer, which, after it was thrown, came back into his hand. He never grew weary, for no matter how much strength he spent in battle, it was renewed by a magic belt which he wore around his waist. Thursday is named from Thor.

Thoreau (*thō'rō*), **Henry David,** was born at Concord, Mass., July 12, 1817. He was graduated at Harvard college in 1837, and became a surveyor. He lived the simplest of lives, spending most of his time in long

tramps through the woods, in the study of nature, and in writing. Emerson says of him: "He was bred to no profession; he never married; he lived alone; he never went to church; he never voted; he refused to pay a tax to the state; he ate no flesh; he drank no wine; he never knew the use of tobacco; and, though a naturalist, he used neither trap nor gun." This "poet naturalist" built with his own hands a small cabin on the banks of Walden pond, near Concord, and lived there by himself for two years. His expenses during these years were nine cents a day, and he gave an account of his experiences in perhaps his finest book, *Walden*, published in 1854. Others were *Cape Cod*, *The Maine Woods*, and *A Yankee in Canada*. No one else has lived so close to nature or so written of it. He died at Concord, May 6, 1862. See *Thoreau, the Poet Naturalist*, by Channing.

Thorn, a conspicuous rigid and sharp structure of plants. Thorns may be transformed leaves or branches, and are most extensively developed by plants of the arid regions.

Thorwaldsen (*tor'wäld-sen*), **Albert Bertel,** one of the greatest of modern sculptors, was born probably at Copenhagen, Nov. 15, 1770. When asked where he was born he said, "I don't know; but I arrived at Rome on March 8, 1797," thus dating his birth, as it were, from the beginning of his career as an artist. He was a son of a poor ship carpenter, and first carved figureheads in the shipyard where his father worked. He had little schooling, and was always a poor writer and speller, but by 1793 he had gained a gold medal for a design, and with it a chance to study abroad for three years. Only after long and hard study did he at last gain recognition by his *Jason*, but from this time, 1803, he prospered. His return to Denmark, in 1819, was triumphal and his reception almost royal. But a year later found him back at Rome, which he made his home. Thorwaldsen died March 24, 1844, leaving to his country most of his great works and the bulk of his fortune, with which to build a museum where they should be kept. Of his many busts, that of Byron is one of the finest. His famous *Christ and the Twelve Apostles* is in the cathedral of Copenhagen. See his *Life*, by Plon.

Thrace (*thrās*), in early times the name of a country bounded by the Danube, Euxine, and Ægean seas, Macedonia, and Illyria. Roughly speaking, ancient Thrace, before the rise of the Macedonian power, embraced the territory now divided into Rumelia and Bulgaria. Under the Romans it only included the part south of the Hæmus or Balkan mountains, while the northern part was called Mœsia. It was a mountainous country, the chief range being the Hæmus, or, as it is now called, the Balkans, the highest peaks of which are over 8,000 feet above the sea. It was marshy and undrained, covered with deep forests of fir, oak, chestnut, etc., but parts of it, as the great plain of Adrianople, was very fertile; cattle, sheep, horses, and swine were kept; and the chief products were wheat, millet, hemp, and wine. Its gold and silver mines led to its conquest by Philip of Macedon. Who the early Thracians were is not known. They were not Greeks, and they lived by robbery and war. The Greeks first heard of them through their coast colonies, the chief of which was Byzantium. But the interior of Thrace kept its independence, except for a short time when conquered by the Persian general Megabazus, until its conquest by Macedonia under Philip and Lysimachus. In 168 B. C., it became Roman territory, was colonized by Sarmatians and Goths, overrun by Attila and Alaric, and conquered by the Turk Amurath in 1353.

Thrush, the common name for any bird belonging to the genus *Turdus*. Thrushes

SONG THRUSH.

occupy the highest rank in the class of birds. They belong to a large family which embraces about 300 species found in most parts of the world. They are usually fine singers. The Eastern hemisphere has a larger number of varieties than the Western. There are five true thrushes common in the eastern United States. Of these the wood thrush is the best known. It is a bird about eight and one-half inches long, cinnamon brown above, with a whitish breast spotted with very distinct dusky spots. As its name indicates, it is a bird fond of woods, but will perch and sing in maples and elms on quiet village streets. Its voice is flute-like and its song lively and engaging. It corresponds to the song thrush of Europe, which is a little larger but other-

wise like our wood thrush. The hermit thrush is a northern bird smaller than the wood thrush. It seldom nests south of Vermont or northern Michigan, and extends northward to the Arctic regions. Wilson's thrush, or the veery, ranges between the two in nesting habits, not extending so far north as the hermit, nor so far south as the wood thrush. It seldom nests south of the parallel of 40°. The common robin is a thrush.

Thucydides (*thū-sid'i-dēz*), the great historian of the Peloponnesian war, was an Athenian, born probably in 471 B. C. He owned gold mines in Thrace, and was one of the few who recovered from the terrible plague at Athens. He was in command of an Athenian squadron in 424, and when summoned to Amphipolis to save it from falling into the hands of the Spartans, arrived the evening of the day on which the place surrendered. For this failure Thucydides was exiled. According to his own account this exile lasted twenty years. It seems certain that he died a violent death, but when or how, is not known. Hardly any literary work has received higher praise than the great work of Thucydides. It is remarkable for its truthfulness, and for the short, simple, and realistic way in which he has recorded facts that must have taken months to gather, sift, and decide upon. See Fyffe's *Primer of Greek History*.

THUCYDIDES.

Thug, meaning a "cheat," is the name of a religious brotherhood in India, which in honor of the goddess Kali, commits murders and lives chiefly from the plunder got from its victims. The Thugs usually band together in gangs of from ten to fifty or more, and travel, if wealthy enough, on horseback with tents, under the guise of traders. Each gang has its jemadar, or leader; its guru, or teacher; its sothas, or entrappers; its bhuttotes, or stranglers, and its lughaees, or grave diggers. They inveigle travelers to join them on the plea of safety, or lie in wait for them. When the victim is strangled and robbed, his body is buried in an out of the way place, and is sometimes mutilated. The Thugs also invest the rivers of India. They are very superstitious, and never commit murder unless all the omens are favorable. It was not till 1831 that energetic measures were taken to stop these practices, but thuggee, as it is called, has not yet wholly disappeared.

Thur'man, Allen Granbery, an American statesman, was born at Lynchburg, Va., Nov. 13, 1813. When six years old his family moved to Ohio. He became a lawyer and was chosen a representative in the 29th congress. In 1851, he was made judge of the supreme court of Ohio, serving as chief-justice from 1854 to 1856. He ran for governor of Ohio in 1867. During his two terms as United States senator (1869–81) he was one of the ablest and most prominent members of that body. In 1888, Thurman ran for Vice-president on the Democratic ticket with Cleveland. He died Dec. 12, 1895.

Thyrsus (*thĕr'sŭs*), a compound raceme or panicle in which a compact pyramidal cluster of flowers is formed, as in the lilac or a bunch of grapes. See INFLORESCENCE.

Ti'ber, a famous Italian river, rises in the Apennines, passes through the city of Rome, and falls into the Mediterranean by two mouths near Ostia, after a course of 230 miles. Between Lodi and Passo del Forello are rapids, and here the river runs through a narrow gorge for several miles. The Tiber is navigable for ships to Rome, 18 miles from its mouth, where it is 500 feet wide, and for boats of light draught to the mouth of the Neva, 72 miles further up. The Tiber has always been noted for its yellow color, which comes from the yellow clay through which it passes. Besides Rome the chief city on its banks is Perugia. Steps have been taken to deepen and otherwise improve the Tiber's course.

Tiberius (*ti-bē'ri-us*), emperor of Rome, was born Nov. 16, 42 B. C. As the stepson of Augustus he was adopted by that emperor, and saw service at the head of the legions on the outposts of the empire. He was popular with Augustus, the soldiers, and the people, and was married to the emperor's daughter Julia. He ascended the throne in 14 A. D., but as soon as the scepter was firmly in his grasp he became the most suspicious and cruel of tyrants. However, his mother, Livia, was the real ruling power till her death in 29 A. D. Her power then fell into the hands of Ælius Sejanus, a Roman knight and a commander of the Prætorian guards, a man of ability. Sejanus ruled well, though he murdered leading citizens whom he disliked, right and left, gaining the power to do so by pouring tales of conspiracy into the suspicious ears of Tiberius, who, meanwhile, was leading a careless life of pleasure on the island of Capri. But Sejanus could not hide his ambition to become emperor in name as well as fact, and fell in 31 A. D. Under the next favorite, Macro, a man of little talent, things went from bad to worse. It was in the reign of Tiberius that Christ was crucified at Jerusalem. The emperor died March 16, 37 A. D., his death being hastened either by poison or smothering.

Tibet or **Thibet** (*tĭ-bet'*), the southeast portion of the great central Asiatic plain, with an average height of 15,000 feet. The Himalayas shut in Tibet on the south; on the north are the Kuen-Lun mountains and ranges; uniting, these two systems separate

Tibet from Kashmir. The Tibetan plain, thus fringed with mountains, is not level, but dotted with mountain peaks and spurs, twenty mountain tops being higher than the loftiest Andes. The Karakorum range shuts in a valley which is drained by the headwaters of the Indus and the Sanpu. The basin of the Sanpu is known as Tibet proper, that of the Indus as Ladak and Bultistan. Further east, the tract drained by the Yang-tze-Kiang is known as Khan. North of the Karakorum range is a large desert, called Khor in the west and Katchi in the east. Lastly in the northeast where the Hoang-ho rises is the hill country of Lake Ko-ko-nor. Owing to its great elevation, Tibet, which has about the same latitude as Naples, has almost arctic winters, and its mountains and great plains rob the air of moisture, in its long passage from the sea, making it very dry. Timber never rots, but becomes brittle, and meat never spoils, but dries until it can be powdered. There are great glaciers in the mountain region, one being thirty-two miles long, four times as large as the Mer de Glace. The plains are like the steppes of Central Asia, and are used for grazing, while the fertile valleys bear fruits and grains. Irrigation is necessary, and terraces are built along the slopes to retain the water. Silver, copper, tin, salt, sulphur, borax, and niter abound, and gold in considerable quantities, but the want of fuel makes the development of the mineral wealth very slow. Tibet is almost entirely under Chinese rule, though the government is in the hands of the Buddhists, the chief priest called the Dalai-lama, and the second called the Bogdo-lama, having charge, one of spiritual matters, and the other of temporal affairs. Chinese soldiers are in all the towns, under Chinese generals, who direct in the most important matters. The language of the Tibetans belongs to the Chinese class of languages, and the religion is Buddhism. The people are skillful, industrious, and intelligent. They are ingenious jewelers, and make fine fabrics of wool and goat hair, and carry on a large trade with China, Turkestan, and India.

About the time of the Christian era, Sakya, the last great teacher of the Buddhists, settled at H'lassa, in Tibet, where he is thought to be still living in the person of the grand lama. In 821, Tibet paid tribute to China, and western Tibet was overrun by the Turks, until driven out by Aurungzebe, in the 17th century. Western Tibet is now under British supervision. Population 6,000,000.

Tick, a kind of mite having the mouth in the form of a sharp beak. They are very common in warm countries and are parasites on cattle. The so-called sheep ticks are insects with six legs, while all true ticks have eight legs, like the spiders. They live on plants and will attach themselves to the skin of man as well as to animals. Those of South Africa and Brazil are dreadful pests. In South America they cling in clusters of hundreds to slender twigs, and transfer themselves to horses and cattle. They bury their heads under the skin and suck blood, becoming as large as a horse bean. Herds of cattle are sometimes killed by the exhaustion produced by these parasites. Wet weather is fatal to them, and infested animals are often freed from them by swimming a river.

Tick'nor, George, an American author, was born at Boston, Aug. 1, 1791. He was graduated at Dartmouth college when but sixteen years old and studied law. In 1820, Ticknor became professor of French and Spanish in Harvard college. His *History of Spanish Literature* was published in 1849, and at once took high rank, and was translated into Spanish, German, and French. His *Life of Prescott* is considered one of the finest biographies ever written. Ticknor died Jan. 26, 1871. See *Life*, by Hilliard.

Ticonderoga (*ti-kŏn-der-ō'ga*), a village of New York, on the outlet of Lake George, 88 miles northeast of Albany. Population 1,911. The French in 1755 built here Fort Carillon, afterward called Fort Ticonderoga, to command Lake Champlain. Two years later, Montcalm led his force of 9,000 men from this fort and captured Fort William Henry, which had been built by Sir William Johnson, at the south end of Lake George. In 1758, General Abercrombie was defeated by its garrison with a loss of 2,000 men; but the next year General Amherst forced the French to dismantle and abandon it. After the battle of Lexington, Col. Ethan Allen stormed Ticonderoga, May 10, 1775. The next year Burgoyne, by planting a battery on Mount Defiance, forced the American garrison to leave Fort Ticonderoga, which the British held until Burgoyne's surrender, though it was attacked by General Lincoln. The British also held it a short time in 1780. Parts of the walls are still standing. See Joseph Cook's *History of Ticonderoga.*

Tides, the periodic rising and falling of the waters of the sea along coasts and inlets. The rising is called the *flood*, and when highest is called *high water;* the falling is called the *ebb*, and at its lowest is known as *low water.* The short lull between tides is called *slack water.* Flood tide and ebb tide each last for approximately six hours, there being two high tides and two low tides daily. Each day high water occurs fifty-two minutes later than the day before, as the average time between two high or low tides is twelve hours and twenty-six minutes. Sir Isaac Newton first discovered the cause of the tides by applying to them his newly discovered law of gravitation, showing that the rising of the waters was due to the difference between the attraction of the moon and of the sun upon the earth as it revolved. As the particles of

water are free to move while the particles of land are not, this attraction draws them toward the moon, forming a swell in the ocean's waters. This swell draws toward it waters from both sides, leaving on the coasts a depression, or low water. Gravitation acts on the solid mass of the earth as if this mass were concentrated at the center of the globe. So on the side of the earth opposite that of the moon the waters are less attracted than the land, being at a greater distance, and are, as it were, left somewhat behind, thus forming another swell, just opposite to the one in the other hemisphere. By the rotation of the earth this system of swells and troughs travels from east to west over every part of the ocean. The attraction of the sun also causes two daily tides, but these solar tides are much smaller than the lunar tides. As the moon and sun are rarely in the same relative positions, their high tides do not usually occur at the same time. But at new moon and full moon they are in line with the earth and their attractions act together, causing especially high water, known as the *spring tides*. At the time of the first and third quarter of the moon, it is at right angles with the sun, and their attractions act against one another, lessening the height of the high water. These are the *neap tides*.

A complete explanation of the tides cannot be given in this place. For this the student is advised to read first of all Sir Robert Ball's *Time and Tide* ("Romance of Science" series: London), then articles 464–84 in Young's *General Astronomy;* next Darwin's *Tides*, a course of popular lectures delivered before the Lowell institute; and lastly Darwin's masterly article on *Tides*, in the *Encyclopædia Britannica*.

In the references just given the tides are treated as a wave motion which they really are and which is the only point of view from which they can be satisfactorily considered. See WAVE MOTION.

Tien-Tsin (*tē-ĕn'tsĕn*), a large city of China, is on the Pei-ho river, thirty-eight miles from its mouth, and eighty miles southeast of Pekin. The old mud and dried-brick houses have been replaced in part by well-built dwellings. The Pei-ho is generally frozen from the middle of December to the middle of March, and the business at other times, carried on by means of boats and junks, is then done by sledges which swarm on the river. Tien-Tsin is an open port; it exports large quantities of cotton, peas, and dates, and imports cotton goods, needles, window glass, sugar, paper, etc. Population 1,000,000.

Tiff'in, a city of Ohio, is thirty-four miles by rail southwest of Sandusky, on the Sandusky river. It is the seat of Heidelberg college, founded in 1850. There are also two daily and four weekly newspapers, a courthouse, three banks, sixteen churches, a convent, and several schools. It manufactures carriages, stoves, furniture, tiles, farming implements, and woolen goods. Population 10,989.

Tiflis (*tif-lēs'*), an important Russian city on the Kur river, 165 miles east of the Black sea. It is the capital of the Russian government of the same name in Trans-Caucasia, and is on the military railroad which joins the Black and Caspian seas. It has a large trade with Persia, and manufactures woolen and linen cloth, carpets, and arms. It is noted for its warm spring baths. Population 160,645.

Ti'ger, the largest and most powerful member of the cat family. The lion appears larger on account of its immense hairy head and mane, but the royal Bengal tigers reach a length of eleven feet and are able to overcome the lion in combat. They have a tawny ground color, with black stripes on the body and limbs, the tail being ringed with black. The common tiger is about eight feet in length.

TIGER.

It is abundant in Hindustan, and does great damage to herds of cattle, and occasionally attacks man. A cattle-eating tiger will kill an ox about every five days, or from sixty to seventy in a year. The hunt of the tiger from the backs of elephants is dangerous and exciting. The range of the tiger is greater than was at first supposed. Starting with India as its chief locality, it ranges west through Persia, east through Burma to Sumatra and Java, and north through China to Manchuria, and even into Siberia. It is absent from Ceylon and Borneo.

Tig'lath Pile'ser. See ASSYRIA.

Ti'gris, a large river of Asiatic Turkey, rises south of Lake Goljik, in the Kurdish mountains, is joined at Til by the Bitlis, unites with its sister stream, the Euphrates, at Korna, and from this point to the Persian gulf the river is known as the Shat-el-Arab. Its whole course is some 1,500 miles long. In its upper part it is a very swift stream. The Tigris was in ancient times the great river of Assyria, and formed the eastern border of Mesopotamia. Nineveh, Seleucia, and Ctes-

iphon stood on its banks. Its chief cities now are Bagdad, Mosul, and Diarbekir. It is navigable for steamers at all seasons below Mosul.

Til'den, Samuel Jones, was born at New Lebanon, N. Y., Feb. 9, 1814. He went to Yale college and the University of New York, and became a lawyer. As a member of the New York assembly in 1846 he was much interested in the state canals, and became one of the leading Democrats of the state. In 1874, Tilden was elected governor of New York by 50,000 majority, and his home popularity, thus shown, gave him the Democratic nomination for the presidency in 1876. The Hayes-Tilden campaign was one of the hardest fought and closest in our history, and the disputed election was given to General Hayes by the electoral commission of fifteen appointed by congress to canvass the votes. Tilden was also a prominent lawyer of New York city. He was one of the organizers of the bar association, and was leading counsel in many large cases. He died near Yonkers, N. Y., Aug. 4, 1886, leaving the bulk of his fortune to found a free library for New York city.

Till'man, Samuel Escue, American soldier and educator, astronomer and chemist, was born near Shelbyville, Tenn., Oct. 2, 1847, and graduated at West Point, entering the army first as an artilleryman and afterward was transferred to the corps of engineers. In 1870, he was appointed assistant-professor of chemistry, and ten years later became professor of chemistry, geology, and mineralogy at West Point; was assistant astronomer of the United States expedition to Tasmania to record the transit of Venus, and has acted on several survey commissions and explorations for the United States government. He is the author of a number of text-books in his branch of science, notably a work on *Descriptive General Chemistry*, and elementary treatises on mineralogy, on the principles of chemistry, and lessons in heat.

Till'y, Johann Tserclaes, Count of, one of the greatest captains of the 17th century, was born in 1559, in Brabant. A pupil of the Jesuits and an officer under the duke of Alba, he developed into a soldier of great sternness. After fighting against the Turks, he was made commander of the Catholic army on the outbreak of the Thirty Years' war, and together with Maximilian of Bavaria gained the important battle of Prague. During the course of this war by his masterly tactics he separated the armies of Mansfield and of the Markgraf of Baden, beat the latter at Wimpfen, and drove Christian of Brunswick from the Palatinate, defeating him at Höcht in 1622, and again the next year in a desperate three days' battle at Stadtlohn. Now made a count of the empire, he defeated the king of Denmark at Lutter, and together with Wallenstein forced him to sign the treaty of Lübeck in 1629. Two years later, he succeeded Wallenstein as commander-in-chief of the imperial troops, took Magdeburg by storm, and allowed his Croats and Walloons to pillage and massacre at pleasure. A few months later he met his match in Gustavus Adolphus, who defeated him at Breitenfeld, and the next spring forced him to retreat behind the Lech river in Bavaria, and crossed it himself in the face of his army. In this last battle, Tilly was mortally wounded and died April 30, 1632. Tilly was temperate, despised luxury and wealth, and his able support of the Catholic party in the war was not due in the slightest to self-interest, but wholly to his devotion to the church.

Timbuktu (*tim-buk'tō*), a city on the southern edge of the Sahara, in central Africa, some nine miles from the Niger. It is about three miles around, and was formerly surrounded by a clay wall. Timbuktu has a large caravan trade, gold dust being the most important export. The people are negroes, Tuaregs, Mandingoes, Arabs, Fulahs, etc. The city was founded in the 12th century, but was first seen by a white man in 1826. Timbuktu now belongs to France, and a railroad is proposed to connect Algiers, Timbuktu, and Senegambia. Population 12,000, greatly increased during the trading season from November to January.

Time, like space, is one of the conditions under which all things are perceived. Time may be defined as *duration*, but it is doubtful whether anything is, thereby, added to the clear idea which every one already has as to the nature of time. Our notion of time as a quantity is derived from the observance of some regularly recurring event, such, for instance, as the vibration of a pendulum. In such a case we say that the "amount of time" elapsing between two events is proportional to the number of vibrations which the pendulum has made between the two events. The unit of time employed by the whole world is the *average* time which elapses between two successive transits of the sun across the meridian. This unit is called the *mean solar day*, and is divided into 86,400 parts called *seconds*, which are the units most frequently employed in measuring small intervals of time. The sun does not move through the sky at a uniform rate; but we can imagine one which does, and which makes the same number of revolutions per year as the actual sun. Such a sun is called the *mean sun*. The instant at which the mean sun crosses any meridian is called *noon* for that meridian, or *local noon*. Time which is measured from a local meridian is called *local time*.

Since 1883 in the United States we have employed time which is counted from Greenwich noon, and which is called *standard* time. Thus the inhabitants of Labrador and Nova Scotia employ time which differs from that at

Greenwich by *exactly four hours;* this is called colonial time. In the extreme east of the United States, neighboring on each side of the seventy-fifth meridian, all correct watches and clocks differ exactly five hours from Greenwich time; this is called *eastern time.* In the Mississippi valley, the time is six hours earlier than Greenwich, and is called *central time.* Fifteen degrees west we have *mountain time;* and along the Pacific coast the time is eight hours earlier than Greenwich, and is known as *Pacific time.*

In like manner *Middle European time* is one hour slower and *Eastern European time* is two hours slower than Greenwich. Recently the Australian colonies have adopted Greenwich time—or, what amounts to the same thing, they use time which differs exactly eight, nine, ten, and eleven hours from Greenwich.

Tim'othy, a disciple and companion of St. Paul. He was the son of a Greek and a Jewess, and his home was either at Derbe, or Lystra in Lycaonia. Paul set him apart as a minister of the new gospel, and after preaching in Macedonia and Achaia, he went, at Paul's request to Ephesus, and accompanied the apostle to Jerusalem. It was to him that the two epistles to Timothy were addressed by the apostle Paul. According to tradition, Timothy suffered martyrdom under Domitian.

Timour (*tē-mör'*), **Timur,** or **Tamerlane,** was the second of the great conquerors whom central Asia sent forth in the middle ages, and was born at Kesh, about forty miles southeast of Samarkand, April 9, 1333. His father was a Turkish chieftain and his mother claimed descent from the great Genghis Khan. When he became tribal chieftain, Timour helped the Amir Hussein to drive out the Kalmucks. Turkestan was thereupon divided between them, but soon war broke out between the two chiefs, and the death of Hussein in battle made Timour master of all Turkestan. He now began his career of conquest, overcoming the Getes, Khiva, and Khorassan, after storming Herat. His ever-widening circle of possessions soon embraced Persia, Mesopotamia, Georgia, and the Mongol state, Kiptchak. He threatened Moscow, burned Azoo, captured Delhi, overran Syria, and stormed Bagdad, which had revolted. At last, July 20, 1402, Timour met the Sultan Bajazet on the plains of Angora, captured him and routed his army, thus becoming master of the Turkish empire. He took but a short rest at his capital, Samarkand, and in his eagerness to conquer China, led his army of 200,000 across the Jaxartes on the ice, and pushed rapidly on for 300 miles, when his death, Feb. 18, 1405, saved the independence of China. In his reign of thirty-five years, this chief of a small tribe, dependent on the Kalmucks, became the ruler of the vast territory stretching from Moscow to the Ganges. A number of writings said to have been written by Timour have been preserved in Persian, one of which, the *Institutions,* has been translated into English. Timour is made the hero of Marlowe's *Tamburlaine,* the first play in which blank verse appeared on the stage.

Tin, a silvery-white metal, with a tinge of yellowish blue, and a high luster. It is softer than gold and can be rolled or beaten out into very thin sheets called tinfoil. It is ductile at 212°, when it can be drawn out into wire which is not very tenacious; it melts at 455°, and volatilizes at a white heat. Air and moisture act on tin very slightly. The peculiar properties of tin, especially its malleability, its brilliancy, and the slowness with which it rusts make it very serviceable. With other metals it forms valuable alloys, as bronze, gun metal, bell metal, pewter, and solder. Tin is very largely used in covering sheet iron, thus forming tin plate.

Tin must have been one of the metals earliest known, as it enters into bronze of which the oldest metallic weapons and tools are made. The largest tin mines of Europe are found in Cornwall in England, which once supplied Tyre and Sidon. There are very large tin deposits in the island of Banca and on the Malay Peninsula, as well as in Australia. Some tin is found also in Bolivia and Peru. Small deposits of tin ore have been found in the United States, but we are wholly dependent upon foreign sources for our supply of this metal. Dioxide of tin is the only important ore; when pure it is made up of seventy-eight parts tin and twenty-two parts oxygen. This ore is gray, yellow, red, and black, and strikes fire with steel. In Cornwall, tin ore is found in veins running through granite and slate, or scattered in crystals through their mass. The dressing of the ore is a hard and delicate operation. It only yields from ten to eighty-four pounds of tin oxide to a ton of material and is so scattered through the mass that it has to be stamped to a fine powder to separate it. It is then repeatedly washed by machinery to get rid of impurities and passed through a furnace to separate the sulphur and arsenic, and is then ready for smelting.

Tintoretto, Il (*el tin-to-rĕt'to*), a great Venetian historical painter, was born in 1512. His real name was Jacopo Robusti, but he was called Tintoretto from the Venetian word meaning dyer, which was his father's trade. He was self-taught except for a few lessons from Titian. He took as his motto: "The design of Michael Angelo and the coloring of Titian." He sketched so fast that he was called the "madman." Among his famous pictures are *Belshazzar's Feast,* a fresco, *The Last Supper, The Last Judgment, The Slaughter of the Innocents,* and *Paradise.* He died at the age of eighty-two.

Tippecanoe (*tip'e-ka-nō'*), a river of Indiana, which rises in Lake Tippecanoe in the northern part of the state, flows southwest 200 miles, and falls into the Wabash, nine miles above Lafayette. On its banks was fought the battle of Tippecanoe, Nov. 7, 1811, in which the Indians under Tecumseh's brother, the prophet, were routed by General Harrison.

Tippoo Sahib (*tip-ō' sä'hib*), sultan of Mysore, and son of Hyder Ali, was born in 1749. He was brought up a Mohammedan, excelled as an athlete, and learned military tactics from the French officers in his father's service. He proved his prowess by routing the British at Perimbakum in 1780 and on the Kolerun river in Tanjore in 1782. After being crowned he returned at once to the head of the army and captured Bednore in 1783. In his second war with the English (1790–92) he laid waste the Carnatic almost to the gates of Madras, but was at last forced to give up a part of his dominions and make peace. The English again attacked Tippoo in 1799, and while bravely defending his capital, Seringapatam, he was killed (May 4, 1799). Tippoo was very popular among his people, who looked upon him as a martyr to the Mohammedan cause.

Tirlemont (*tēr'lmon'*), a city of Belgium. Population 16,157. Here the French general Dumouriez routed the Austrians March 16, 1793, thus winning a most important battle.

Tiryns (*tī'rinz*), one of the very oldest cities of Greece, was in Argolis in the Peloponnesus. According to the account handed down, it was founded by Prœtus, a king of Argolis, and its walls were built by the Cyclopes. Here Hercules passed his boyhood. Probably about 468 B. C. the city was destroyed by the Argives. The ruins of Tiryns are one of the finest specimens of what is called cyclopean architecture, and with those of the neighboring city of Mycenæ are the grandest of all in Greece. The walls were over twenty feet thick, formed of unknown stones of enormous size.

Tissot (*tē-sō'*), **James Joseph Jacques,** an eminent French genre painter, famous for his series of pictures representing the life of Christ on earth, painted during a ten years' visit to the Holy Land, was born at Nantes, France, Oct. 15, 1836. He was educated at the École des Beaux Arts, in Paris, and under such masters in art as Lamothe and Flandrin. He made his first appearance in the Paris *Salon* in 1859, with a number of fine water colors, etchings, etc., and in 1861 he painted his *Rencontre de Faust et de Marguerite*, now in the Luxembourg, Paris. His other notable canvases include *Return of the Infant Prodigal*, *Confidence*, *A Widow*, *An Interesting Story*, *The Captain's Daughter*, *On the Thames*, *A Young Girl in a Boat*, and *A Young Woman in Church*. M. Tissot then turned his attention to his series of religious subjects illustrating the *Life of Christ*, for which a firm of French publishers, it is said, has paid him over a million francs. The series, 365 in number, were painted each on the spot traditionally associated with its subject, and were exhibited in London and Paris, where they won fame for the distinguished artist.

Titans (*tī'tanz*), **The,** in Greek story, were the sons of Uranus (Heaven) and Gæa (Earth). Urged by their mother, the Titans, headed by Kronos, rose against their father, dethroned him, and set free from Tartarus their brothers the Hekatoncheires (hundred-handed) and the Cyclopes. The Titan Kronos now made himself king, and for fear he should be dethroned by one of his children, as it was foretold he would be, swallowed each as soon as it was born. The only son to escape was Zeus, who was saved by his mother causing Kronos to swallow a stone wrapped in a cloth, believing it to be his child. Zeus at the end of a ten years' war conquered the Titans and hurled them down into a dungeon below Tartarus, surrounded by a brazen wall, and guarded by the hundred-handed.

Titian (*tish'an*) or **Tiziano, Vecelli,** one of the greatest of painters, was born at Capo del Cadore, in the Alps, in 1477. His father sent him to Venice to study painting when he was ten years old. He was very quick at reproducing the special features of any artist's work, and sometimes beat his masters. The completion for the Venetian senate of a picture begun by Bellini, who was one of his teachers, gained him fame and an office worth 300 crowns a year. He became acquainted with the duke of Ferrara and the poet Ariosto, whose portraits he painted, and on his return to Venice painted one of his grandest pictures, the *Assumption of the Virgin*. Pope Leo X. and Raphael invited him to Rome, and Francis I. to France. He painted the portrait of Charles V., and spent three years in Spain. There is no complete catalogue of Titian's works, but over 600 of his pictures are known. Far beyond his power as a designer, and beyond his gifts of imagination, is the splendor, boldness, and truth of his coloring. See his *Life*, by Northcote. He died at Venice in 1576.

Titicaca (*tē-tē-kä'kä*), a South American lake, 1,200 feet above the sea. It lies partly in Bolivia and partly in Peru, and is 100 miles long, and about 35 miles broad. Some very remarkable ruins are found on its small islands, which seem to belong to a higher civilization than was found in the country when it was conquered by the Spaniards. There are pyramids covering several acres, and doorways, pillars, and statues sculptured in a peculiar style. On the cornice of a doorway is a human figure with a crown of rays and crested serpents. The statues were all

on a large scale, and the whole region is strewn with the great sculptured blocks. Two steamers ply on the lake, having been carried in pieces across the Andes in 1871, and a railroad from Arequipa to the lake has been built, which opens the country, with its rich stores of silver, copper, and timber, and its products of chocolate, coffee, and alpaca wool.

Tit'lark, a class of small birds, coming between the larks and the wagtails. They live in all parts of the world, building their nests on the ground, of dry grass, lined with hair. The American titlark is a little over six inches long, olive brown, shading to a yellowish brown and white, with black bill and feet. In the fields or prairies it is often found in flocks of tens or hundreds running on the ground. The Missouri titlark is the American bird which is most like the skylark of Europe.

Tit'mouse, the common name of a number of small birds related to the warblers. There are about seventy-five species, found chiefly in the Old World. Four species inhabit the eastern United States. The commonest of these is the well-known black-capped chickadee, which is a winter as well as a summer resident in the southern part of its range. This bird is about five inches long, gray above and white below washed with brown. The crown and throat are black and the cheeks white. Its familiar call is *chickadee*, and it has besides this, a high, sweet whistle of two or more notes. It ranges from Labrador south to Indiana and Virginia. In the south it is replaced by a smaller southern chickadee. The tufted titmouse is the largest of the American species, being about six and one-fourth inches long. All these birds of America are dull colored, but some of the true Tits of the Old World, are among the brightest birds of the northern hemisphere. For example, the azure tit of Siberia is white and sky blue, and the blue tit of Europe is blue, white, and yellow.

BLUE TITMOUSE, MALE AND FEMALE.

Ti'tus, mentioned in the Bible as a companion of Paul, was a Greek sent from Antioch to Jerusalem to confer with the apostles. He traveled with Paul, going with him to Jerusalem, was sent by him to Corinth, and left at Crete, where, according to tradition, he was made the first bishop of Crete.

Ti'tus Fla'vius Sabi'nus Vespa'sianus, emperor of Rome, was the eldest son of Vespasian, and was born at Rome, Dec. 30, 40 A. D. Brought up at the court of Nero, he became well trained in manly exercises and a good scholar. He saw service as military tribune in Germany and Britain, and as commander of a legion in Judæa under his father. When Vespasian became emperor, Titus was left to carry on the Jewish war, which he brought to a close by the capture of Jerusalem in 70 A. D. after a long siege. On his triumphal return to Rome he was received with joy by the citizens, and made a fellow-ruler of the empire by his father. He speedily lost the good will of the people, however, by many acts of tyranny and by a life of pleasure, and on his becoming sole emperor, at his father's death in 79, Rome looked forward to having a second Nero reign over them. But he at once put a stop to prosecutions for acts of disrespect to the emperor: had informers scourged, and banished or sold as slaves; built the colosseum and the Baths of Titus, and delighted the people with public games which lasted 100 days. In 79, when the great eruption of Vesuvius took place, which buried Herculaneum and Pompeii, in 80 when a three days' fire laid waste Rome, and during the plague that followed it, he despoiled his palaces to aid the sufferers. In this way Titus became one of the most popular of Roman emperors, but in the third year of his reign he suddenly died, perhaps poisoned by his younger brother, Domitian, Sept. 13, 81 A. D.

Tivoli (*tiv'o-lē* or *tē'vo-lē*), a city of Italy, eighteen miles east of Rome, stands on the slope of Monte Ripoli, one of the Apennines. It is a walled town, with a fortress, steep, narrow streets, and a cathedral, which was once a temple of Hercules, where Augustus held his court. Since the time of Pliny, its vineyards have been noted for their fine-flavored grapes, and the travertino stone, of which a great part of Rome is built, comes from Tivoli. Near the city is the temple of Vesta, built in 76 B. C., the remains of the villas of Hadrian and Mæcenas, and the ruins of early Roman mausoleums, baths, aqueducts, etc. Tivoli was called in Roman times Tibur, is mentioned in 446 B. C., and is said to be older than Rome. It is one of the few towns of Latium still on their old sites. It was also a noted suburb of Rome, Scipio, Marius, Horace, and many other prominent Romans having their Tiburtine villas. Population 10,400.

Toad, an amphibian animal related to the frog, having a similar structure and life history. The skin of the toad is covered with warts, but the milky secretion of the skin is harmless. Toads are more terrestrial than frogs; after they become mature they return to water only to lay eggs, while frogs always remain near the water. Their eggs can be distinguished from those of frogs from the circumstance that they are laid in long strings of gelatinous substance, instead of masses of the same, as with the frog. The toad is now often used for making nature observations in

schools. The Surinam toad carries its eggs and young upon its back in small, rounded depressions of the skin.

Toad'stool. See BASIDIOMYCETES.

Tobac'co, species of *Nicotiana*, a genus of the nightshade family. *N. tabacum* is the best-known species, but *N. rustica* is also much cultivated. Tobacco was introduced to the civilized world by the discovery of America, where the natives were found using it. The valuable properties are found in the leaves, which are dried and cured. More tobacco is produced in the United States than in any other country, and it is said to supply one-half of the tobacco of commerce. It is grown as a commercial product in almost every state of the Union, Kentucky very far exceeding all other states in acreage under cultivation. The next states in order are Virginia, North Carolina, Tennessee, and Ohio. Outside of the United States the cultivation of tobacco is chiefly in tropical and semi-tropical countries, a certain rich plain in Cuba (Vuelta del Abajo) producing the finest grades.

VIRGINIAN TOBACCO.

Tobac'co Worm. See CATERPILLAR.

To'cantins', a river of Brazil, 1,000 miles long, from the junction of the Almas and Maranhao rivers to the Rio Para, into which it falls. Its branches are the Araguaya, Paraman, Great Somno, Tucahunas, and Theresa. The Tocantins is eight miles wide at its mouth, and the tide ascends the river for 300 miles.

Tocqueville (*tōk'vil*), **Alexis Charles Henri Clerel de,** was born at Paris, July 29, 1805. He studied law and became a judge at Versailles in 1826. Five years later, the French government sent him to the United States to examine the penitentiary system. This mission gave him the chance to study American institutions, and resulted in his writing his masterpiece, *Democracy in America*, one of the very ablest of the many books on America by foreigners, and which is still of the highest authority. His other chief work was *The Ancient Regime and the Revolution*. De Tocqueville was in politics from 1839, when he was chosen deputy, till his release from a short imprisonment at the time of Napoleon III.'s seizure of power in 1851. For five months in 1849 he was minister of foreign affairs. He died at Cannes, April 16, 1859.

Todleben (*tōt'lā-bĕn*), **Franz Eduard,** General, was born at Mitau, in Courland, Russia, May 20, 1818. He attended the school of engineers at St. Petersburg. From 1848 to 1851 he was with the Russian army in the Caucasus fighting the native leader Shamyl (whom see). In the Crimean war he became known throughout the world for his defense of Sebastopol (which see). After strengthening the fortifications of Cronstadt and Nikolaiev, he was made chief of engineering in the war office in 1860. He took a prominent part in the last Russo-Turkish war. General Todleben wrote a history of the defense of Sebastopol, which has been translated into English and other languages. He died near Frankfort, July 1, 1884.

Tokat (*to-kät'*), a city of Asiatic Turkey, sixty miles south of the Black sea. It is shut in by mountains on three sides, and so suffers a furnace-heat in summer. There are large gardens and vineyards, copper is smelted, and cotton is manufactured. There is now only a small trade, though Tokat was once an important business center. Population about 10,000.

Tokay (*to-kā'*), a wine made from vines growing in the neighborhood of the town of Tokay, Hungary. The Tokay wine district covers about 15,000 acres. Great care is taken in assorting the grapes and in preparing the wine, which is brownish yellow while new, changing to a greenish hue as it grows older. The yearly yield is about 1,550,000 gallons. The wine gathering is celebrated by a national festival.

Tokio or **Tokyo** (*to'kī-o*), meaning "eastern capital," formerly called Yeddo, is the

capital of Japan, and stands in the eastern part of the main island, Honshiu, at the head of Yeddo bay. The city covers nearly sixty square miles, and is divided into thickly built and inhabited districts, separated by large

gardens and groves, and cut by canals and moats. In the center is the fortress guarded by stone walls, and a moat, beyond which another wall shuts in about three square miles, while a third wall incloses about five square miles. Wide clean streets, lighted by gas, brick and stone buildings, and western merchandise in the stores gives Tokio the look of a European city. Shinto shrines and Buddhist temples stand in the cemeteries, and there are four Christian churches. The Imperial University of Tokio, supported by the government, has over 100 foreign teachers. There are banks, newspapers, steam factories, carriages, jinrikishas (which see), theatres, telegraph connection with other cities, and railroads to Yokohama and Saikyo. The famous general and statesman, Iyeyasu, fixed his seat of government at Yeddo, the "port," in 1600, and here his descendants reigned until 1868, when as a result of the revolution against the Shogun, the Mikado established his court here, and changed the name of the city to Tokio. The city has suffered greatly by fires, and by earthquake shocks in 1656 and 1854. Yeddo was thrown open to settlement by foreigners as the result of the treaty made by Commodore Perry between the United States and the Shogun of Japan in 1854. Population 1,440,121.

Tole'do, a famous Spanish city, formerly the capital of the country, stands on the Tagus, which surrounds it on three sides, fifty-five miles southwest of Madrid. It is built on a number of hills 2,400 feet above the sea. The Tagus is its fortress, rushing around it between high and rocky banks, and leaving only one approach on the land side, which is defended by an inner wall built by the Gothic King Wamba in the 7th century, and by an outer wall built by Alfonso VI., in 1109, both remarkable for the number and beauty of their towers and gates. In the middle of the city rises the high cathedral, surrounded by many churches and convents. This superb cathedral, built in 1492 on the site of a Moorish mosque, though plundered in 1521 and 1808, is still remarkable for its stained glass, sculptured choir, and gilded metal pulpits. The famous Toledo blades known in the time of Livy, who wrote about them, were so perfectly tempered that they were sometimes curled up like watch springs and packed in boxes. The Moors captured Toledo in 714; it became a part of Castile in 1085. In the heyday of its career it is said to have sheltered 200,000 people. Population 21,000.

Toledo, a city of Ohio, was organized in the year 1833 by the union of the villages of Port Lawrence and Manhattan. It is situated on both sides of the Maumee river, near its mouth, and covers an area of nearly 28 square miles.

There are points in and about Toledo that are of great historic interest. Gen. Anthony Wayne, Gen. Wm. H. Harrison, Commodore Perry, General Proctor, and the Indian chiefs Pontiac, Little Turtle, and Tecumseh have made Toledo and the Maumee valley of great interest to students of history.

According to the census of 1900, there are only twenty-five cities in the United States with a larger population. Toledo ranks third in population in Ohio and is destined to become a great commercial center. It is located at the southwestern extremity of Lake Erie, and is, therefore, the natural lake port for the trade and commerce of the Ohio and Mississippi valley region, including the greatest corn-growing belt in the world, the oil and coal fields of Ohio and Indiana, the salt, lumber, and iron of Michigan. The Ford Plate Glass works, the Libby Glass factory, the National Malleable Castings company, the oil refineries, the Automobile factory of the American Bicycle company, and the Craig ship yards, are some of Toledo's leading industries.

Toledo is a city of beautiful homes. It has a fine system of parks and boulevards; its street-car system, twenty-six railroads, steamboat, and electric lines give rapid transit to all parts of the country. Its modern school system is among the best in the United States. It was organized in 1898 upon the federal plan of government. The city supports a fine public library, the Toledo university, two high schools, a city normal school, manual training schools for high school and elementary departments, 40 primary and grammar schools, enrolls 22,000 pupils and employs about 500 teachers. Population 131,822.

Tolstoi (*tol'stoi*), Count **Leo** (or **Lyof**) **Nikolaivitch,** an eminent Russian novelist and social reformer, was born at Yasnaia Poliana, in the government of Tula, Russia, Aug. 28, 1828, and was educated at the University of Kasan (Russia in Europe). Early in life he was a soldier, and served in the army in the Caucasus and in the Crimea, where he was present at the battle of the Tchernaya, and at the storming, by the allied forces, of Sebastopol. This experience enabled him to write with such graphic force not only his narrative on *Sebastopol*, but his tale of Napoleon's invasion of Russia, entitled *War and Peace*. *Anna Karénina*, a tale of guilty passion, placed him among the masters of fiction. This was followed by a number of works which have earned for him the title of

COUNT LEO TOLSTOI.

"the prophet of renunciation," and led him to lead the life of an anchorite, toiling on his land with his own hands, sharing his crust with the humblest, in rigid obedience to Christian precept. He is an uncompromising opponent of coercive government and a bitter arraigner of modern society. His other writings embrace *My Religion*, *Resurrection*, the *Kreutzer Sonata*, *Master and Man*, *My Life*, *My Confession*, *Patriotism and Christianity*, *The Christian Teaching*, *The Kingdom of God within Us*, and *The Four Gospels Harmonized and Translated*.

Toltecs. See MEXICO.

Tomat'o Worm. See CATERPILLAR.

Tombig'bee, a river of Mississippi and Alabama, which rises in the northeastern corner of Mississippi, receives the Black Warrior, and by its junction with the Alabama, forms the Mobile river, about 45 miles above Mobile. It is about 450 miles long and is navigable for large steamboats to Columbus, Miss., 366 miles from Mobile bay.

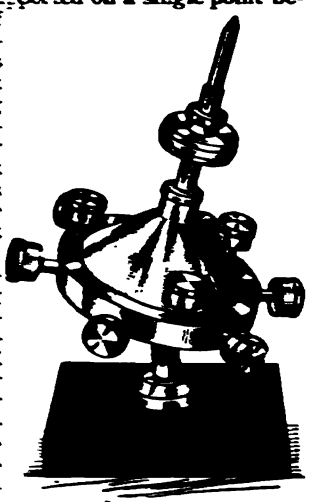
Tongue (*lingua*), a muscular organ, reaching from the hyoid, or tongue bone, backward and downward, and in front to the teeth. The upper surface, borders, and front third of the lower surface are free; while the remaining parts are fixed to neighboring parts by the covering of mucous membrane. At certain points, this membrane, on leaving the tongue, forms folds containing fibers, which act as ligaments to the tongue. The largest of these folds is called the frenum, or bridle of the tongue, and joins its free front end to the lower jaw. This bridle limits the backward movement of the tip of the tongue. In rare cases it reaches to the tip, so as to interfere with speech and chewing, and the child is said to be tongue-tied. The upper surface is divided into two parts by a middle, lengthwise furrow. For the little hills on the top of the tongue, see TASTE. At the back of the surface are mucous glands, reaching into frog canals and helping to secrete the fluid that moistens the tongue. The furrow on the under surface is deeper with veins running forward on each side of it. The base of the tongue becomes wider before being fixed in the tongue bone, which, together with the ligaments, is the tongue's framework. There are two sets of muscles, the extrinsic or outside muscles, which fasten the tongue to certain parts and move it to them and in various ways; and the intrinsic muscles, which pass from one part of the tongue to another, make up its chief bulk, and move it in itself. By the action of the various muscles the whole tongue may be drawn back, its upper surface be hollowed or bowed, or pressed against the roof of the mouth; its tip may be thrust straight out or sideways, forward and downward, or into a hollow back where food might lodge. See TASTE.

Tonk'a Beans. See VANILLA.

Tonquin'. See COCHIN-CHINA.

Toombs, Robert, American politician, member of the Confederate congress (1861), and Confederate secretary of state, was born in Wilkes county, Ga., July 2, 1810, and died at Washington, Ga., Dec. 15, 1885. After graduating at Union college, and studying law at the University of Virginia, he was returned a member of congress in 1844, and in 1850 contributed to the passing of the compromise measures. From 1853 to 1861 he was a member of the United States senate, a southern Extremist and leading Disunionist. In 1861, he became secretary of state in the Confederate government, but resigned this to accept the commission of brigadier-general, and to serve in the war on the Southern side. He was present at the second battle of Bull Run, was at Antietam in 1862, and in 1864 commanded the militia of Georgia. After the war he lived abroad till 1867, denouncing strongly the reconstruction measures of congress, and on his return to the South he refused to take the oath of allegiance to the United States government.

Top, the ordinary spinning top is a rapidly rotating solid supported on a single point below the center of gravity. Suspended in this way the weight of the top acting through its center of gravity exerts a moment of force which tends to tilt the top. The result is that the top "precesses," instead of falling over this exhibiting those phenomena so well known to every boy of ten. For a detailed explanation of the dynamics of the top, see WORTHINGTON'S *Dynamics of Rotation*, chap. xiii., or PERRY'S *Spinning Tops*: Society for the Promotion of Christian Knowledge: London. Clerk Maxwell devised a top having more or less the shape of a bell, so that the point of support could be placed at, above, or below the center of gravity. It is provided also with adjusting screws as shown in the accompanying figure, so that its mass can be distributed in various ways about the axis of rotation. The chief interest attaching this particular form of top, besides the fact that it illustrates most beautifully the general prin-



MAXWELL'S DYNAMICAL TOP.

ciples of rotation, lies in the fact that it simulates very accurately the motion of our earth on its axis, demonstrating on a small scale the phenomena of precession, nutation, variation of latitude, dynamic and static instability, etc. See Maxwell's original account in his *Scientific Papers*, Vol. I., pp. 248–68; also a detailed and popular account in the *Physical Review*, Vol. VI., March, 1898. See GYROSCOPE.

To'paz, a mineral and a gem, the finer varieties of which are much valued for their luster and the beauty of their colors. It is made up chiefly of alumina, silica, and fluorine. It is usually found in very old rocks and in most parts of the world. Fine topazes are found in Ceylon, but those most prized come from Brazil. Topaz is either colorless or in many shades of red, blue, green, or yellow; it is translucent or almost transparent on the edges, and is harder than quartz. When cut or set, topazes are easily mistaken for diamonds or rubies, but they are not as hard as either of these gems.

Tope'ka, the capital of Kansas, is built on both sides of the Kansas river, and is 300 miles west of St. Louis. The surrounding country is a rich, rolling prairie. It is a large milling center, and has manufactures with a yearly output of $10,000,000. It is also an important railroad and distributing point. It has electric street railroads, broad streets, and handsome churches and buildings. Among the public buildings are the capitol, United States government building, and the state asylum for the insane. The free public library has 10,000 volumes, the Kansas Historical Society library 40,000 volumes, and the state library 28,000 volumes. Its schools of higher learning are Washburn college, founded in 1865, having 250 students; an Episcopal college for women; and a Roman Catholic seminary. Topeka was settled in 1854, and became the state capital in 1861. Population 33,608.

Top'lady, Augustus Montague, was born at Farnham, Surrey, England, Nov. 4, 1740. He went to Westminster school and Trinity college, Dublin, became a clergyman, and preached in Devonshire and in London. He was for a time editor of a religious magazine, and published several religious books. He is remembered as a hymn writer, especially as the author of *Rock of Ages*. Toplady died at London, Aug. 11, 1778.

Torna'do. See STORM.

Toron'to, the second city of Canada, and capital of Ontario, is on Lake Ontario, near the river Don, thirty-six miles northeast of Hamilton. The town covers about 15,000 acres, part of it in large parks. The government house, customhouse, city hall, two fine opera houses, and the legislative halls are among the finest buildings. It is well supplied with schools, including the normal school, college of technology, Toronto university, University college, Upper Canada college, Knox college, Trinity university, and St. Michael's college. Among its charitable institutions are the city hospital, insane asylum, orphan asylum, and boys', girls', newsboys', and servants' homes. The water that supplies the city is taken from the lake, filtered by its passage through the sand of the island that forms the bay in front of the city, then carried in sunken pipes across the bay, and pumped into reservoirs. The city has a large trade, and manufactures boots and shoes, furniture, cars, ale, and whiskey. Toronto was the capital of Upper Canada from 1794 until 1841. After the union of Upper and Lower Canada, the seat of government was at Toronto and Quebec alternately. Since 1867, it has been the capital of Ontario. Toronto, known as York until 1834, was taken by the Americans in 1813. Population 207,971.

Torpe'do, the popular name for electrical fishes closely related to the skates and rays. They are capable of giving electrical shocks, and are also called cramp fishes. There are fifteen or twenty species inhabiting mainly the warmer seas, but one species is found on the Atlantic coast from Cape Cod south. It has a broad disk-shaped body with a stout tail and reaches a length of three to five feet. It is black above and whitish below. The electrical organs in all these fishes consist of two clusters of six-sided prisms, one on each side between the head and the broadly expanded pectoral fin. There are about 500 prisms in a single organ. The latter is richly provided with nerve fibers, and the discharge is under the control of the fish.

Torpe'do, an apparatus or machine designed to destroy ships by blowing them up with an explosive. Torpedoes are either stationary, floating, or moving. Stationary and floating torpedoes are used in defensive operations, as in harbors or rivers. They are placed in the harbor, either being anchored or allowed to drift within certain limits, and so arranged that they explode by contact with a ship or can be exploded by an electrical contact from some convenient point. Moving torpedoes are projected through the water, either on or below the surface, and explode upon coming in contact with a ship. They may depend for motion wholly upon the original force of projection, or they may be supplied with some motive power by which they move themselves. When they are projected, they are usually discharged by compressed air from a long tube called a torpedo tube. Many war-ships are fitted with these torpedo tubes, but special boats called torpedo boats are more often used for the purpose. A torpedo boat is a small fast steamer, fitted with appliances for launching torpedoes. Some navies have somewhat larger steamers which

have great speed, and are equipped with fast-firing guns for protecting the large cruisers and battleships from torpedo boats. Such boats are called torpedo destroyers. Torpedo destroyers are also supplied with torpedoes and torpedo tubes for offensive operations. The use of torpedoes in warfare dates back to the 16th century, when floating torpedoes were used to blow up bridges, etc. During the American Revolution floating torpedoes were tried with little success against Lord Howe's ships, both in New York harbor and on the Delaware river. Col. Samuel Colt, of Hartford, Conn., made numbers of experiments for the United States government about 1840. These experiments were in many ways successful, but did not lead to the general use of torpedoes. During the American Civil war, the Confederates made large use of torpedoes as a means of defending their ports, and twenty-four United States war vessels and transports were destroyed by torpedoes. Torpedoes were used successfully by the Germans in 1870–71, in keeping off the French war-ships, and again by the Russians in the Russo-Turkish war in keeping the Turkish ships out of the Danube. During the Spanish-American war, the Cuban harbors were mined, and so kept out the United States war-ships, but no ships were destroyed by torpedoes on either side. Within recent years much study has been given to submarine boats for torpedo warfare. The "Holland" submarine boat has been successfully experimented on by the United States. The French are also reported to have numbers of successful submarine boats for torpedo warfare. The study of this science is carried on with great secrecy by the different nations. The American naval school for this work is at Willet's Point, in New York harbor.

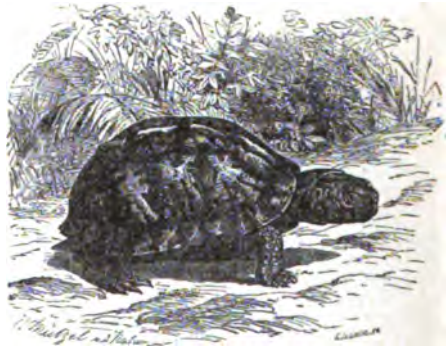
Torpe'do-boat. See TORPEDO.

Torquemada (*tor-kā-mä'thä*), **Tomas de,** a Spanish monk, was born at Torquemada, Spain, about 1420. He was a Dominican friar, and was made inquisitor-general for Spain in 1483. He is famous as the organizer of the Inquisition, with its tribunals at Seville, Cordova, and Toledo. He was too zealous even for the persecuting spirit of the age, and Pope Alexander VI. appointed four colleagues to hold him in check. He obtained the expulsion from Spain of the Jews and Moors. He died at Avila, Sept. 16, 1498.

Tor'rey, John, an American botanist, was born at New York, Aug. 15, 1796. While studying medicine in New York, he founded the Lyceum of Natural History. He was professor of natural sciences at West Point for three years, of chemistry at Princeton, and also had the same chair in the medical college at New York. His reputation as a chemist brought him the position of United States assayer, which he held for nearly twenty years. The results of his work on the state geological survey of New York and on several United States exploring expeditions are found in several publications: *Catalogue of Plants Growing within Thirty Miles of New York*, *Flora of the State of New York*, *Flora of the Northern and Middle States* (one volume), etc. His fine botanical library and the collections of forty years he gave to Columbia college, New York. He died March 10, 1873.

Torricelli (*tor-rē-chel'lē*), **Evangelista,** an Italian physicist, especially remembered as the inventor of the mercury barometer. He was born at Faenza, Oct. 15, 1608, and died at Florence, Oct. 25, 1647. His work was largely inspired by the writings of Galileo, whose pupil and private secretary he was during the last three months of Galileo's life. Torricelli substituted mercury for water in the barometer and found that it rose only 30 inches instead of 33 feet in a closed tube. This led him to the conclusion that the cause of the ascent was, in each case, the pressure of the earth's atmosphere. This conclusion was shortly afterward clinched by Pascal, who carried a barometer to a mountain top and found that the mercury fell as he ascended. Besides two important theorems in the mechanics of solids, Torricelli enunciated the theorem that a liquid flows from an orifice with the same speed that it would have acquired in falling freely from the surface of the liquid to the level of the orifice. See BAROMETER.

Tortoise (*tôr'tis*), a name loosely applied to any turtle, but more correctly restricted to



BOX TORTOISE.

particular members of the turtle family. The true tortoises are land turtles, represented in the United States by the wood tortoise, the box tortoise, and the burrowing turtles of the southern states. They feed upon plants and fungi. Their shell is usually highly arched, with the hard plates showing concentric markings. Their nearest relatives are fresh-water species like the painted and speckled turtles, which are also sometimes, incorrectly, called tortoises. The so-called tortoise shell comes from a salt-water turtle, called the hawksbill. See TURTLE, TERRAPIN.

Tortug'as. See DRY TORTUGAS.

Tor'ture, a means of extorting confession of guilt by inflicting severe pain. It was used at first on slaves, and with the Romans on those who were not Roman citizens. Paul protested against the use of it, saying: "Is it lawful to scourge a man that is a Roman uncondemned?" Under the emperors the use of it became general, extended through Europe, and reached its severest form in the tribunals of the Inquisition. The scourge; the rack, which stretched the whole body, sometimes until the joints were dislocated; the boot, rings of iron around the legs with wedges driven in until the flesh was mashed to a jelly, and the thumb screw, were among the many hideous instruments used. Judicial torture in England was inflicted only by order of the sovereign, and the last use of it was in 1640. France abolished it in 1786, and Russia in 1801; Austria, Prussia, and Saxony about the middle of the 18th century.

To'rus (in plants), the same as "receptacle." See FLOWER.

To'tal Ab'stinence or **Tem'perance.** The abuse of intoxicating liquors early led to the formation of temperance societies to influence public opinion on the subject, and to help those who were endeavoring to overcome the appetite for strong drink. The first temperance society in the United States was formed at Litchfield, Conn., in 1789, by 200 farmers who pledged themselves not to use liquors in carrying on their farm work. Early in the nineteenth century the temperance movement became organized, and the churches, especially the Methodist and Presbyterian, were active in the work. The Massachusetts Temperance society was formed in 1813, and the American Temperance union in 1826. The early societies were strictly temperance societies and not total abstinence organizations. They did not oppose the use of wine, cider, or malt liquors, a brewery being built in Boston by the temperance reformers. The first national temperance convention met in Philadelphia in 1833, and formed a national temperance union, with twenty-three state societies and over 7,000 other societies. "Total abstinence from all that intoxicates" was first insisted on in 1833 by the Massachusetts society.

The Washingtonian Temperance society was formed by six reformed drunkards, at Baltimore, in 1840, and was very successful in its special work of reforming hard drinkers. The Sons of Temperance was another society which numbered in 1850 about 240,000 members. The Good Templars, another temperance order, founded in 1852, is a secret society with passwords, grips, etc., with a membership of about 750,000. The most remarkable movement in the temperance cause, perhaps, is what is known as the *Crusade*, which began in Washington Court House, O., in 1873. It was a crusade of women against saloons, and the weapons used were prayer, persuasion, and persistence. The movement spread rapidly and was the means of closing many saloons, in some places all that were in operation. The Woman's Christian Temperance union is the successor to this temperance crusade. It has organizations in every state and territory of the United States, in Great Britain, Canada, Australia, New Zealand, India, Japan, Madagascar, South Africa, and the Hawaiian islands. It has been active in distributing temperance literature, in securing the study of temperance science in the public schools, in the establishment of homes for girls, and in securing laws forbidding the sale of tobacco to children. The badge is a bow of white ribbon. The headquarters are at Chicago, where the society has built the Woman's Temperance temple, one of the finest buildings in Chicago.

The first laws against the use of liquor were made in Massachusetts, in 1639, and about the same time in Connecticut. In 1756, a duty was imposed on imported liquors in Pennsylvania, and in 1774 the first continental congress proposed to the different states the passage of laws to stop the distilling of liquors. The ration of grog in the army was changed to coffee in 1832. License laws were passed in some states, but met with strong opposition. After the supreme court had decided in favor of prohibitory laws, in 1847, Maine was the first state to make use of the power. Delaware, Rhode Island, Vermont, New Hampshire, Massachusetts, Michigan, Iowa, Indiana, and Kansas have all passed laws prohibiting the sale of liquors, but the law has been repealed in most of the states, and license laws substituted. The Prohibition party has grown up from the effort to induce congress to favor national prohibition.

The temperance movement in Great Britain began in Scotland in 1828. Under Father Mathew 1,800,000 persons joined the total abstinence societies, and the amount of whiskey used in Ireland diminished one-half in three years. The National Temperance league, British Temperance league, Irish Temperance league, Scottish Temperance league, and North of England Temperance league are among the principal temperance organizations in Great Britain.

Toucan (*tō'kan*), the name for birds with enormous bright-colored bills, inhabiting South America and ranging as far north as Mexico. The bills are light as they are filled with air cavities. These birds feed on bananas, insects, and reptiles. They frequent lofty trees. They are sometimes confused with the horn bills of Africa, birds with greatly enlarged bills, but belonging to a different family.

Touch (*tŭch*), that one of the five senses by which contact, or pressure, is perceived. It is also usually made to include the senses of temperature and pain. It is possessed

more or less acutely by all parts of the free surface of the body, walls of the mouth, and nasal passages. Its delicacy depends upon the number of particular touch-organs in a square inch, and also on education. The blind, for example, can be taught to read by passing their fingers over raised letters, and physicians and some artisans acquire an educated touch of remarkable acuteness. Touch is most accurate in the tip of the tongue, the palm of the forefinger stands next, and the back is the least sensitive to contact. The whiskers of cats and other similar organs increase the efficiency of this sense. As regards the temperature of sense, it has been shown that there are distinct hot and cold spots lying close together on the surface of the skin.

Toulon (*tō-lon'*), a city of France, on the Mediterranean, thirty miles southeast of Marseilles. It is on a double bay, sheltered by mountains, and has the largest military port on the Mediterranean, covering 240 acres, with large buildings, arsenals, floating docks, etc. The cathedral, town hall, military and naval schools, and theatre are among its finest buildings. Shipbuilding and the trade connected with the military and naval works are the principal industries of the city. Toulon was used as a harbor by the Romans. The fine fortifications built to protect the city from pirates withstood an attack of the English and Dutch fleets in 1707. The English captured the city in 1793, but were driven out by Napoleon. Population 95,276.

Toulouse (*tō-lōz'*), a French city on the Garonne river, 130 miles southeast of Bordeaux. The beautiful church of St. Sernin, the cathedral, a very fine museum of art, a public library, an observatory, and an arsenal, are among its attractions. It has manufactures of woolen and cotton goods, cutlery, and hardware. Toulouse was the capital of the Visigoths, in the 5th century. From the 8th to the 13th centuries it was governed by counts or dukes, and was then attached to the French crown. The battle of Toulouse, in which Wellington was victorious over the French under Soult, was fought April 10, 1814. Population 149,963.

Tourgee (*tōr-zhā'*) **Albion W.**, an American author, was born at Williamsfield, O., May 2, 1838. He studied at the University of Rochester, N. Y.; enlisted as a private in the 27th New York volunteers; was wounded at Bull Run and again at Perryville; and was held a prisoner for four months. He moved to North Carolina, where he was prominent in the reconstruction of the state, drawing up the constitution, and aiding in the revision of the laws of the state. His writings, besides legal works, include *Toinette*, *Figs and Thistles*, *A Fool's Errand*, and *Bricks without Straw*. In 1897, he was appointed consul to Bordeaux, France.

Tourmaline (*tōr'malin*), the name of a mineral found in granite, gneiss, and sometimes in sandstone. The color varies according to the materials they are made of. The blue, pink, and green ones have little iron in them, while the black ones are probably colored by iron. Silica, boric acid, alumina, lithia, soda, lime, magnesia, etc., enter into their composition. Tourmaline is found in Maine, Massachusetts, New Hampshire, and Vermont, in red, green, and blue crystals, while brown ones are found in New York, and very fine black ones in California. In the Ural mountains, the island of Elba, and the St. Gothard mountains fine specimens are found. See *The Tourmaline*, by Hamlin.

Tournament (*tōr'na-ment*), a military festival or contest. They were usually contests between knights on horseback, and the name came from the skill needed in turning their horses. If only two knights contended it was called a joust, while several combatants made it a tournament. Invitations to a tournament were given by princes or nobles by heralds, and the attending knights came with large retinues and gay banners, while crowds of gaily dressed spectators filled the seats around the place of contest. The rules of the tournament prescribed the kinds of weapons to be used, the mode of warfare, and the rank of those who might enter the lists. The prizes awarded by judges were given by the ladies. The early tournaments were like the gladiatorial shows in Rome, often resulting in the death of the combatants, and were for a time forbidden in England, and opposed by the church, but during the crusades they came into favor, and flourished as court pageants until Henry II. of France received a fatal wound, when they were abolished in Europe. See *Ivanhoe*, by Scott.

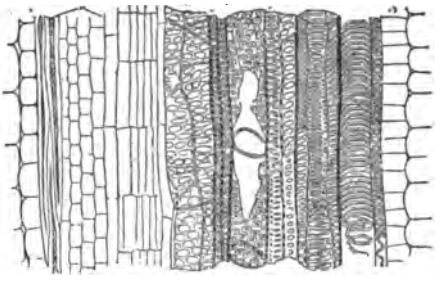
Tours (*tōr*), a French city, at the junction of the Loire and Cher rivers. The finest bridge in France crosses the Loire. There are two towers standing of the famous Church of St. Martin of Tours. Tours is known for its silk manufactures, being the first place to introduce the trade, which was so extensive that it had 80,000 inhabitants when the repeal of the Edict of Nantes drove away its best artisans. The states-general of France met in Tours at different times during the 15th and 16th centuries. It was occupied by the Germans in 1871. Population 63,267.

Toussaint (*tō-san'*), **Francois Dominique**, called also "L'Ouverture," the black chieftain of Haiti, was born of slave parents near Cape François, Haiti, in 1743. In 1791, the mulattoes and blacks of the island made a struggle for their rights, and Toussaint, after helping his master to escape with his family to Baltimore, joined the army, and soon became a general, capturing the white army without bloodshed. The black leaders at first

accepted the help of the Spaniards, but when the English invaded the island, where French and Spanish and colored troops were all contending, Toussaint declared for France, which had proclaimed freedom for the slaves. He joined the French leader, drove the English and Spanish from the island, and was made commander-in-chief of St. Domingo. The civil war between the mulattoes and blacks ended in the whole island becoming subject to Toussaint, who governed it under the French. He selected a council of nine members, composed of eight white citizens and one mulatto, which chose him president for life. The constitution adopted was sent to France; but Napoleon, the first consul, said: "He is a revolted slave whom we must punish." A fleet of 30,000 men and 66 war vessels was sent to Haiti to re-establish slavery, and after ineffectual efforts to conquer the island, offers of peace were made, promising with solemn oaths the liberty of the people and that Toussaint should be retained in power. He signed the treaty of peace on these conditions, but was seized treacherously, with his family, and sent to France, where he was imprisoned without trial or accusation, in a cold underground dungeon at Besançon. He sent appeals for trials and his defense to Napoleon, but got no answer. At last worn out with cold and left four days without food or drink, he was found dead in his cell, April 27, 1803. Whittier and Wordsworth have embalmed the name of Toussaint L'Ouverture in their poems.

Tower of Lon'don, a famous ancient citadel erected by William the Conqueror about 1078 A. D. to dominate the city of London, situate in the oldest part of the British metropolis, on the north bank of the Thames, about a mile below London bridge. It is surmounted by a keep, known locally as the White tower, — the council chamber of the early English kings. The tower is historically notable for the many distinguished persons — traitors and others — who have been confined within its walls as prisoners of state, or who have met death on the scaffold or at the headsman's block on the adjoining Tower hill. In modern days, it has become the repository of the national arms; and since the restoration, the regalia or crown jewels have been kept in the Tower on exhibition.

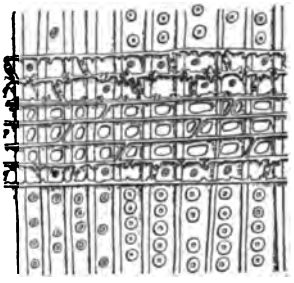
Trachea (*tra'kē-ă*), (in plants), the characteristic element of wood or xylem, the tracheæ together constituting the tracheary tissue. A trachea is a vessel composed of a single elongated cell or of several cells set end to end. The cells are usually of large caliber, with very heavy walls, which are variously thickened. In some cases the thickening consists of a spiral band, in others of distinct encircling rings. Frequently the thickening of the walls leaves definite thin spots, called "dots" or "pits." In this way the spiral, annular, and dotted ducts or vessels are formed. The tracheary tissue is chiefly concerned in the conduction of water from the roots to the



Vertical section of stem from the epidermis (at the left) to the pith (at the right), the vessels or tracheæ being recognized by their large size and by their pits and spirals.

leaves; and frequently it is an important or even the chief mechanical support of the body.

Tracheid (*tra'kē-id*), (in plants), a single cell with all the wall features of a trachea, but which does not unite with others to form a vessel. It is more or less elongated and taper-pointed, like a fiber. Tracheids form the characteristic soft and straight-grained wood of pines and other conifers. In these forms, as in all gymnosperms, the walls of the tracheids contain "bordered pits," that is, pits which appear to have a double border about them. This type of pit is a constant feature in gymnosperms, so that the group may be recognized even by a single wood fiber.



Vertical section of pine wood, showing the pitted tracheids crossed by a pith ray.

Trade Mark, the name or device used to distinguish the merchandise of a firm from that of others. Tradé marks are protected by law in nearly all countries, in order to protect buyers from frauds and to enable a merchant or manufacturer to profit by the superiority of his goods. In the United States, a merchant or firm registers its trade mark in the patent office and is entitled to its use for thirty years, and to renew it for thirty years more.

Trade Winds. See WIND.

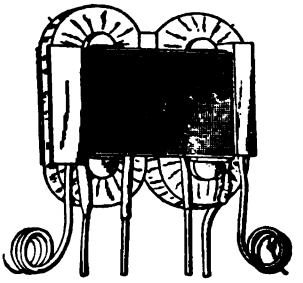
Trafalgar (*traf-al-gar'*), **Cape,** on the south coast of Spain, is celebrated for the great naval battle gained off its shores, Oct. 21, 1805, by the British fleet under Nelson over the combined fleets of France and Spain. The British had 27 sail of the line and 4 frigates, the French and Spaniards 33 sail of

the line and 5 frigates. The British were victorious, capturing nineteen of the enemies' ships. As Nelson bore down on the French he hoisted the famous signal, "England expects every man to do his duty." At the height of the action the famous sea captain was shot, but was told of the victory before he died. In a storm that night, all but four of the prizes were lost or destroyed, a disaster which would not have happened had the dying admiral's order to anchor been obeyed.

Traill, Henry Duff, D. C. L., an English man of letters and editor of *Literature*, was born at Blackheath, London, Aug. 14, 1842, and died at London, Feb. 21, 1900. He was educated at the Merchant Taylors' school, London, and at St. John's college, Oxford, and in 1873 joined the staffs of the *Pall Mall Gazette*, the *Saturday Review*, and *The Observer*, and afterward became editor of *Social England* and of *Literature*. His writings include, besides *Lives* of Sir John Franklin, Lord Cromer, and Lord Salisbury, a work on *Central Government*, *William III.* ("Twelve English Statesmen" series) *Strafford* ("English Men of Action" series), *Sterne*, and *Coleridge* ("English Men of Letters" series), *Shaftesbury* ("English Worthies" series), *The New Lucian*, *Saturday Songs*, and *The New Fiction, and other Essays on Literary Subjects.*

Tra'jan, Marcus Ulpius, Roman emperor, was born at Italica, near Seville, Spain, Sept. 18, 52 A. D. He was a successful commander in the wars against the Parthians and Germans under Titus and Domitian. In 91 A. D., his prestige gained him the consulship, and six years later Nero adopted him as his fellow-ruler and successor. In 98, he became emperor, and celebrated the event by the gift of large sums to the soldiers, and also to the citizens and their children. He also had the state pay the expenses of bringing up the children of poor freemen in Rome and other Italian towns. In 101, Rome for the first time saw its emperor leading forth his legions in person, when Trajan set out on his first campaign against the Dacians. The conquest of the brave people, who had been paid tribute by the Romans since Domitian's reign, was not finished till 105. After going back to Rome to celebrate this conquest, the first since the time of Augustus, he started to wage war in the east. Armenia and Parthia, Mesopotamia, North Syria, and Arabia, were conquered, or reconquered, and Trajan was the first Roman general to sail down the Persian gulf. Trajan's government was of the best. Under his rule, the laws were carried out with justice, and the governors were held to strict account. Military roads, canals, bridges, and towns were built. Trajan's wall, a line of earthworks from the Danube to the Black sea, was raised, and Rome was beautified; among the improvements were Trajan's forum, and the famous Trajan's column, whose bas-reliefs still tell the story of his military achievements. He died in August, 117 A. D.

Transfor'mer, an apparatus for converting the energy of an electric current into the energy of a secondary electric current. There are two kinds of transformers in commercial use, the static or alternating current transformer, and the rotary transformer. The A. C. transformer converts a primary A. C. into a secondary A. C., but so that the product of the current and pressure or potential (amperes x volts) of the primary current is practically equal to the corresponding product of the secondary current. Thus, an ordinary electric lighting transformer transforms 1 ampere at 1,000 volts into 10 amperes at 100 volts, etc. This is a "step-down" transformer. In a "step-up" transformer the voltage or pressure of the secondary current is higher than that of the primary current. Transformers are used on account of economy of distribution of electric energy. It requires a much smaller wire to transmit economically a given amount of electrical energy at 1,000 volts pressure than to transmit the same amount of energy at 100 volts. But the higher voltage cannot be well and safely used for many purposes, as for incandescent lamps, so that the current is transmitted on the main wires at the higher pressure and transformed down to the lower pressure by an A. C. transformer just before passing into the house where it is to be used. Previous to 1883, practically all the electric lighting from central stations was done by direct current, but the successful application of the A. C. transformer by Gaulard & Gibbs, Stanley, and others, reduced the cost of the transmission lines so much, that within a few years practically all the central station incandescent lighting was done by the A. C. systems. The A. C. transformer is simply a form of the induction coil (which see) but has an alternating current in the primary coil instead of a make and break device. It consists of two separate coils of insulated wire, having a laminated iron core common to both coils. The primary A. C. current is sent through one coil and this induces a secondary current in the other coil and its circuit. The ratio of conversion is that of the number of turns on the two coils. Thus, to transform from 1,000 volts to 100 volts (a ratio of 10 to 1), the primary coil has 10 turns for every one turn on the secondary coil. Step-up transformers are



COILS AND CORE OF AN A. C. TRANSFORMER.

used on long-distance electric power lines. Thus, in a California transmission line, the generators can safely generate currents at only 5,000 volts, and 60,000 volts is used on the lines. Here a step-up transformer is used at the dynamo having the conversion ratio of 1 to 12, and proper step-down transformers are used at the other end of the line to reduce the voltage for power and lighting applications. The efficiency of the A. C. transformers depends on the quality of the iron in the core, and upon the proper proportioning of the parts. In good commercial transformers an efficiency of 98 to 99 per cent. on full load is commonly attained.

In a rotary transformer, an alternating current is transformed into a direct current, or vice versa. A rotary transformer is a form of dynamo machine having field magnets and armature similar to an A. C. dynamo, but having a D. C. commutator on end of armature shaft, and A. C. collector rings on the other end. Such a machine is used in central electric plants, where it is desired to generate and transmit A. C., but it is necessary to use D. C. for street car motors, or for electrochemical processes. See INDUCTION COIL.

A. P. CARMAN.

Tran'sit means, in astronomy, the passage of a planet across the disk of the sun, or of a satellite across the disk of its primary, that is, the planet about which it revolves. Mercury and Venus have orbits which lie within the orbit of the earth, and so their transit can be observed. The transits of Venus are of great importance, as they are one of the means used to determine the sun's distance. Other methods had been tried without giving accurate results, until Halley, in 1716, proposed a method of employing the transits of Venus. Accordingly, the transits of 1761 and 1769 were observed in various places, and in 1824 Encke from these observations reached a generally accepted result. A transit can take place only when the planet is in a line between the earth and the sun. There are always two transits of Venus eight years apart, and then a lapse of 105 or 122 years, when another pair of transits occur, with eight years between them. The transit of 1874 was followed by that of 1882, but there will not be another until 2004. Mercury is nearer the sun, thus having a shorter orbit and year, and therefore more frequent transits.

Transmis'sion of Pow'er, a branch of mechanical engineering treating of the means of transmitting power from a point where it is generated to the point where it is to be used. For short distances, as in a machine shop, shafting and belting are commonly used. For longer distances four systems have been used, the wire rope, the pneumatic, the hydraulic, and the electric. The above division does not include the indirect method of carrying gas to the point where it is to be used, in a gas engine or otherwise, nor the method of carrying live steam to considerable distances from the boiler, a method which is only resorted to in extreme cases. The question of transmitting energy is not only one of engineering possibility, but also involves economical questions. Some of the questions that have to be considered are: the losses along the line of transmission due to friction (mechanical or electrical) or other causes, the deterioration of the installation, interest on the investment, the cost of attendance, the number of horse-power to be transmitted, the number of hours in the year of full load, the cost of power at the two ends of the line, besides questions of convenience, etc.

In wire rope transmission, the power is transmitted by a wire cable carried over pulleys between the two stations. It is used in street car systems (see CABLE ROADS), in manufactories, in mines, etc., and for distances up to three miles is commercially efficient provided the load is large and continuous. Beyond that the efficiency decreases very rapidly owing to the cost of installation, and the dead weight of cable to be carried. In hydraulic transmission, water is carried under pressure in pipes or conduits and hydraulic motors of some form used. The losses in the pipes are decreased by decreasing the velocity of flow and increasing the pressure, but these conditions require large and strong pipes, items adding to the cost of installation, and therefore to the interest charges. The efficiency of hydraulic transmission is always low, 50 per cent. or less, but it is well adapted for short distances where great forces are required, as in lifting large loads and exerting great pressures. In pneumatic transmission, the power is transmitted by compressed air in pipes to pneumatic engines and tools. It is a system used largely in mining where pneumatic drills are used, and within a few years its use in connection with many machine tools has greatly extended. Pneumatic tools, such as riveting machines, drills, presses, etc., are usually very convenient in operation, and although the mechanical efficiency of the whole system is low owing to the thermal losses in compressing the air, yet the use of pneumatic transmission for short distances is increasing, owing to the convenience of operation, flexibility and portability of tools. In mining and tunneling, it has the great additional advantage of furnishing necessary ventilation along with power. For efficiency, flexibility, economy of operation, and cost of operation no system of power transmission can compete with electrical transmission for longer distances. For longer distances, such as twenty-five to one hundred miles, it is the only system by which power transmission is possible, and even for short distances, as in machine shops, it is competing with belts and shafts. Many shops and factories are to-day putting in motors for each machine, and thus doing away with belts and shafting. Long-distance power transmission by electricity is the most

notable engineering achievement of recent years. It began in the experimental plant of Marcel Deprez at the Munich exposition of 1882. The line was from Miesbach to Munich, a distance of 37 miles, the power transmitted was ½ H. P. and the pressure was 1,350 volts. The dynamos and generators were similar Gramme machines. This plant was of small magnitude, but it established the possibility of long-distance transmission. During the next few years power transmission was developed largely in the way of stationary motors operated on central station lines, and especially in electric railways. (See ELECTRIC RAILWAYS.) Economical transmission of electric energy for long distances requires high voltages, and high voltages cannot be handled easily except in alternating current apparatus (see TRANSFORMER), so that long-distance transmission was not fully developed until the invention of the successful A. C. motor, the polyphase induction motor. (See ELECTRIC MOTOR.) In 1891, an experimental line from Lauffen to Frankfort-on-the-Main, was shown at the Frankfort Electrical exhibition, in which over 100 H. P. was efficiently transmitted 110 miles at 20,000 volts by the use of three-phase A. C. apparatus. Since then, numbers of large commercial plants have been installed, transmitting thousands of H. P. from three to 35 miles. The Fresno, Cal., the Folsom-Sacramento, and the Niagara Falls plants are probably as notable as any of these plants; but the plants at the Lachine Rapids, Montreal, at Portland, Ore., that of the Standard Electric company of California, and several plants in Switzerland and Italy are equally interesting to the engineer. In the Fresno plant, 1,000 H. P. is transmitted 35 miles by a three-phase system from a water plant in the Sierras to the city of Fresno. The city of Sacramento, Cal., is supplied by a similar system, with about 4,000 H. P. from the falls at Folsom, 23 miles away. At Niagara Falls, 50,000 H. P. is generated by ten dynamos, run by turbines, and the power is distributed as far as Buffalo, 27 miles away. The Standard Electric company lines bring electric power into San Francisco and San José from a point in the Sierra Nevada mountains. The electric cars and lighting of San José are supplied by electric currents generated 83 miles away. All these long-distance lines have been built to transmit the power from water-power, but it is one of the plans of the future to establish generating plants at the mouth of coal mines and transmit the power instead of the coal to cities within a radius of from two or three hundred miles.

A. P. CARMAN.

Transpira'tion (in plants), the loss of water by evaporation from a plant. Since 50 to 98 per cent. of the plant body is water, it loses water whenever the air contains less moisture in proportion to its capacity than the plant. Transpiration is therefore unavoidable under the conditions of most land plants. To reduce this unavoidable loss, the larger land plants make the outer tissues of the aërial parts nearly waterproof. But the air passages (see AËRATION) permit evaporation from the cells bounding them; hence the moisture diffuses through the stomata (which see) to the outer air. Were evaporation prevented by waterproofing these cells also, the absorption of gases for food making and respiration would be nearly impossible. The amount of transpiration varies greatly in different plants according to their structure and contents; in the same plant it varies with age and the varying external conditions, such as temperature, light, moisture, etc. Therefore, only a very general idea can be given of the amount of water transpired. On a hot summer day a plant with five square meters (about six square yards) of foliage (such as a thrifty sunflower as high as a man might have) will evaporate about 1.2 liters (2.5 pints) of water. A birch forty feet high, with perhaps 200,000 leaves, will give off on a hot day 300 to 400 liters of water (about 2.5 barrels). But these rates would not be kept up as an average through the growing season. The evaporation from a leaf surface is 2 to 7 times less than that from an equal area of water.

Transvaal (*trans'väl*) **Colony** (Transvaal meaning "beyond the Vaal" [river]), formerly known as the South African Republic, under the presidency of S. J. Paul Kruger; but since the British occupation, in consequence of the Boer war and its annexation to the crown, now known as the Transvaal colony. Its area is 119,139 square miles, while its population (before the war of 1899–1901) was 1,094,156, of which about 250,000 were whites, chiefly Dutch burghers engaged in stock rearing and farming. The colony lies north of the Vaal and south of the Limpopo rivers; it is bounded on the west by Bechuanaland, on the north by Rhodesia, on the east by Portuguese, East Africa, and Zululand, and on the south by Natal and the Orange River colony. Swaziland, on the southeast, was formerly a protectorate of the late republic. The country was first occupied by the Boers, who left Cape Colony in 1836–37; but since the discovery of gold, in 1886, in what is known as the Witwatersrand range of hills, about 70 per cent. of the population are or rather were "Uitlanders." Pretoria is the capital; but Johannesburg, the center of the gold fields, is the most populous. For the history of the events which led to the overthrow of the South African Republic and the annexation of the Transvaal to the British crown, see BOER WAR.

Transylva'nia, a grand duchy of the Austro-Hungarian empire, on the southeast of Hungary, separated from Rumania by the Transylvanian Alps, in which are found peaks 8,000 feet high. Other ranges cross the country, and divide it from Hungary proper. Gold, silver, quicksilver, copper, lead, iron,

tin, coal, alum, and salt, with such precious stones as garnets, agates, amethysts, carnelians, and jaspers are found. A bed of rock salt from sixty to eighty miles wide extends through the whole country. The valleys are very fertile and raise large crops of corn, hemp, flax, and tobacco. Woolen and silk goods, paper, gunpowder, glass, soap, and furniture are among the more important manufactures. The people are made up of various races, such as Magyars, Saxons, Rumans, Armenians, Greeks, Jews, Bulgarians, and Gypsies, the Rumans numbering about three-fifths of the whole. There is a university at Klansenberg, opened in 1872. Transylvania belonged to Dacia in the time of the Roman Empire, and after being overrun by Huns, Goths, Lombards, Bulgarians, etc., was finally conquered by the Hungarians in the 10th and 11th centuries. It was independent in the early part of the 16th century, but in 1713 was annexed to Austria. Area 21,512 square miles. Population 2,284,048.

Trap, a class of igneous rocks, that is, those rocks which owe their origin to fire, called "trappa," meaning a stair, because they break up in columnar forms, producing cliffs that stand out in great steps on the sides of hills and mountains. They are made chiefly of feldspar and hyroxene. Trap rocks when freshly broken usually have a green color, some being a very light green and others nearly black; the weathered surfaces are usually rusty in color. Some trap is very compact, looking like flint. Basalt is a dark, heavy variety of trap rock. The Palisades on the Hudson river just above New York city are cliffs of trap rock.

Treas'ury, Depart'ment of. See UNITED STATES.

Trebizond (*treb'i-zond*), a Turkish seaport on the Black sea. It is surrounded by hills, which take in many gardens, as well as the town, and is defended by forts and a citadel. There are mosques and Greek churches, copper foundries, dye works, etc. Its large trade with eastern Europe and Central Asia make it, next to Smyrna, the chief commercial city in Asia Minor. Trebizond was a flourishing town when Xenophon reached it on his retreat from Persia. After it was conquered by the Romans, it rose in importance, Trajan giving it a larger and better harbor. When the Crusaders took Constantinople, in 1204, Alexius I., one of the imperial family, founded the empire of Trebizond, till then a province of the Byzantine empire. It remained independent till captured by the Turks in 1461. Population 35,000.

Tree, the climax form of vegetation. There is no line of separation between shrubs and trees, but when a woody plant rises from the ground as a single shaft which is higher than a man, there is general consent to call it a tree. The ordinary trees of temperate regions not only continuously increase in height, but their trunks and branches increase in diameter. As a rule, during each growing season a cylinder of new wood is laid down around the old wood. In a cross-section these successive cylinders appear as concentric rings, and by counting the rings the approximate age of a tree is obtained. This habit of adding new wood each year, which increases the conducting capacity of the stem just so much, enables the tree to increase its display of branches and foliage each year. Such a habit is found only among the gymnosperms and dicotyledons. In the former group, the leaves are mostly persistent, the trees being commonly called evergreens; while the dicotyledonous trees of temperate regions are mostly deciduous. The palms are common illustrations of monocotyledonous trees, in which there is no diameter increase, hence no branching worthy the name, and no annual increase of foliage display. The tallest trees, species of the Australian genus *Eucalyptus*, do not quite reach 500 feet. The largest trunks in girth range from 80 to 100 feet, and are developed by such forms as eucalyptus species, the sequoia, bald cypress, and the baobab-trees of Senegal. A Mexican bald cypress is on record with a girth of 112 feet. See FORESTS.

Trench, Richard Chenevix, an Irish clergyman and writer, was born at Dublin, Sept. 9, 1807. He studied at Cambridge, and, after traveling a few years, became a country curate; then a theological professor in King's college, London; next, dean of Westminster; and finally, archbishop of Dublin. His principal writings are, *Notes on the Miracles*, *Notes on the Parables*, *Lessons in Proverbs*, *Synonyms of the New Testament*, *Deficiencies in our English Dictionaries*, and *The Study of Words*. He died at London, March 28, 1886.

Tren'ton, the capital of New Jersey on the Delaware river, twenty-eight miles northeast of Philadelphia. The state buildings include the capitol, post office, lunatic asylum, a normal school, state library, and near by a soldiers' orphans' home. The most important industry is the manufacture of pottery. There are also foundries, breweries, paper mills, woolen mills, rubber works, etc., employing in all 14,984 hands. Trenton was named in 1720 after Col. William Trent, who owned the site. It was made the capital of New Jersey in 1790. It is known as the scene of a battle in the Revolutionary war, when, Dec. 26, 1776, Washington, with his forces, crossed the Delaware and surprised the Hessian troops at Trenton, taking over 1,000 prisoners. Population 73,307.

Triangula'tion, a branch of surveying and geodesy, in which the position of points on the earth's surface are determined by measur-

ing with great accuracy a base line and then constructing triangles on this. By measuring the angles, and knowing the base line, the other distances become a matter of trigonometrical calculation. In connection with the survey of the United States being made by the coast and geodetic survey, a series of such triangles extending across the country has been fixed with great accuracy. The exact shape of the earth is determined from such triangulation in connection with astronomical observations of latitude and longitude.

Trichogyne (*trik'o-jin*), (in plants), a tubular, hair-like process developed from the female organ (*carpogonium*) of the red seaweeds. See RHODOPHYCEÆ.

Trichome (*trik'ōm*), (in plants), a general term applied to outgrowths from the epidermis, chief among which are hairs. See HAIR.

Trichina (*tri-kī'na*), a minute worm parasitic in the muscles of swine and some other animals, and very dangerous, since it can be transferred to man. The transformation comes by eating lean or imperfectly cooked pork. This worm (*Trichina spiralis*) was discovered in 1835 by Richard Owen. It is about one-twentyfifth of an inch long, and, when in a quiet condition, lies coiled in a capsule or cyst within the muscles of the infected animal. When infected meat is eaten by man, the capsules are dissolved within the stomach and the worms set free. An immense number of new and very minute worms are soon produced — each female being able to supply 1,500 to 2,000 eggs. The newly hatched worms bore through the walls of the intestine, and get into the blood vessels and lymph passages, and are thus carried all over the body. They make their way from the blood vessels into the muscles, and there become full-grown and inclosed in capsules. From that time they are quiet, and, if the patient can survive the period of migration, he recovers. The connection of this worm with the disease was made known about 1860 by Leuckart, Virchow, and others. It is difficult to say how the pigs become infested, but the worm is found in the rat, and as these are about slaughter houses and sometimes eaten by pigs, the infection may come in that way.

Trieste (*tre-est'*), a seaport of Austria, at the head of the gulf of Trieste, on the Adriatic sea, seventy miles northeast of Venice. There is an old town, with narrow streets and black walls, built on the slope of a hill and surmounted by a castle. Its cathedral has stones with Roman inscriptions built into its walls, and a tower resting, it is said, on the foundation of a temple of Jupiter. The new town, on the plain toward the sea, is a handsome city with a fine harbor. There are extensive manufactures for making soap, rope, white lead, wax, and leather. The people are Germans, Americans, Italians, Greeks, Jews, and Dalmatians, but the majority speak Italian. Trieste, as Tergeste or Tergestum, was plundered by neighboring tribes as early as 51 B. C. In 1382, it passed into the hands of Austria. Population 158,344.

Trinidad (*trin-i-dad'*), the most southern of the West Indies, lies off the coast of Venezuela, nearly opposite the mouth of the Orinoco river. It is fifty miles long and from thirty to sixty miles wide, and includes 1,754 square miles. The two channels to the harbor are called the "Dragon's Mouth" and the "Serpent's Mouth." On the northern coast are forest-covered mountains, one with two peaks, called Tamana, while the rest of the island abounds in fertile valleys and plains. There are some good-sized rivers and several fine harbors. A lake, with pitch floating on its surface, is one of the curiosities of the island. The most important products are cocoa, sugar, rum, molasses, coffee, cotton, cocoanuts, and oil. There are 204 public schools, with 24,866 pupils, many private schools, and a Queen's Royal college, and a Roman Catholic college, with a total of 299 students. The chief town, Port of Spain, originally built of wood, was burned down in 1808. The new town, built of stone, is one of the finest in the West Indies. The island was discovered by Columbus in 1498 and named by him Trinidad, because he first saw three mountain summits from his ship. In 1797, it was taken by the British from the Spanish, and in 1889 Tobago was annexed to it. Population 260,517.

Tripoli (*trip'o-li*), one of the Barbary states of Northern Africa, lying between the desert and the Mediterranean. It covers 398,900 square miles. The Atlas mountains, which end here, run parallel to the coast, and are lower than in the other Barbary states, being not more than 4,000 feet high. There are no rivers and very little rainfall, and vegetation must depend on the heavy dews. In the coast regions, which are very fertile, cotton, grain, and tropical fruits grow, while in the interior, senna, dates, and carrots are grown, and the lotus flourishes. Sheep and cattle are raised in large numbers, and the horses and mules of the country are celebrated. Tripoli is a dependency of the Turkish empire, its governor being appointed by the sultan. The trade, once considerable, has declined since the new routes through Central Africa have been opened, and since the abolition of the slave trade. Tripoli belonged to the Carthaginians, and was taken from them by the Romans; then, with the rest of Northern Africa, passed into the hands of the Arabs and became Mohammedan; and finally was taken by the Turks in 1552. Population 800,000.

Trip'oli, a city of Africa and capital of the state of Tripoli, is on a point of rocky land projecting into the Mediterranean. It is the

principal seaport of the country, and is built with high walls and bastions, mosques, synagogues, and Christian churches. It has some important manufactures, such as leather, carpets, and scarfs. It is the starting point for caravans for the Sudan, which gives it a large trade, though somewhat decreasing of late years. The people are nearly all Mohammedan, but the business is mostly in the hands of the Jews and Christians. Population 40,000.

Tri'reme, the name given anciently to a galley or vessel with three banks of oars. The oars were arranged in banks or rows, one above the other. The oars of the lowest rank were the shortest, and the rowers had the easiest work and the least pay. There was a small sail also that could be used with a good wind. The crew consisted of 200 men, and often they moved the vessel as swiftly as a modern steamboat. The crew was usually composed of convicts and of slaves, taken in war, and could hope for no release save that of death. The triremes were used in the Persian and Peloponnesian wars, but later the galleys were made with five banks of oars and called quinqueremes.

Triumvirate (*trī-um'vi-rāt*), the name of an office among the Romans, filled by three persons. There were triumvirates for the regulation of public affairs, mentioned near the end of the republic. The government, under Julius Cæsar, Pompey, and Crassus, in 60 B. C., is called the first triumvirate, but the title was never formally given to them. The first triumvirate was that of Octavius, Antony, and Lepidus, in 43 B. C., though usually called the second. They held office for ten years. One set of triumvirs in Rome had charge of the night police and another of the prisons.

Trollope (*trŏl'up*), **Anthony,** an English novelist, was born in 1815. He was for thirty-three years in the British postal service, and visited the United States, Austria, and the West Indies in the interests of the service. Some of his histories appeared first in *St. Paul's Magazine*, of which he was editor. His novels include *Orley Farm*, *The Bertrams*, *The Small House at Allington*, *Barchester Towers*, *The Last Chronicle of Barset*, and many others, as he was a most prolific writer. He also wrote a *Life of Cicero*, a *Life of Thackeray*, and works on *North America* and *South Africa*. He died Dec. 6, 1862.

Trom'bone, a musical instrument, a form of the trumpet. The name is from the Italian, and means a great trumpet. It is a brass wind instrument, made in two parts, so that by sliding one part into the other, or drawing it out, the tube through which the air passes can be lengthened or shortened, and the depth and power of the tone changed. Three kinds of trombones are used, called alto, tenor, and bass trombrones, according to the pitch. The tone of the trombone is grander and more powerful than that of the trumpet, making it a very effective instrument in an orchestra.

Tromp, Martin Harpertzoon van, a Dutch admiral, was born at the Briel, Holland, in 1597. He was captured at sea when a boy, in a fight on the coast of Guinea, in which his father, a Dutch commander, was killed. He served as cabin boy for his captors for more than two years. In 1624, he was in command of a frigate, and in 1637 was at the head of a squadron of eleven ships. His first victories were over the Spanish fleet, taking in one battle, Oct. 21, 1639, thirteen ships. In November, 1652, he encountered the English fleet under Admiral Blake, in the strait of Dover, and drove them before him, sailing up the channel with a broom at his masthead, to denote that he had swept his enemies from the seas. He was defeated by the English in February, 1653, after a terrible three days' fight; and again in June of the same year, when he lost seventeen vessels. In July, 1653, the struggle between the Dutch and English was renewed off the coast of Holland, the Dutch losing thirty men-of-war and their great Admiral van Tromp. He was buried at Delft.

Trop'ic Bird, the name for three species of sea birds that are commonly seen in the tropics far from shore. During the breeding season they frequent rocky shores and cliffs, but build no nests. The more common variety, sometimes seen on the coast of Florida, is about the size of a partridge. It has white plumage with fine black markings above and black bands on its wings. These birds have the two central tail feathers greatly prolonged, and are, therefore, called marlinspike and boatswain birds by sailors. Those of the Pacific ocean are rose colored.

Trop'ics, the two lines of latitude parallel to the equator, drawn, one through the winter, and the other through the summer, solstice. They are equally distant from the equator, being about 23° 28′ north and south of it, and include between them all those points of the earth's surface where the sun is ever vertical or directly overhead. The northern line is called the tropic of Cancer, because the sun, which is directly over this tropic at the summer solstice, enters then the constellation of Cancer; the southern line is called the tropic of Capricorn, because the sun when vertically over it, enters the constellation of Capricorn. The country between the two tropics is called the torrid or hot zone, and the temperature is known as tropical. The word tropic comes from a Greek word meaning a turning, and indicates that the sun turns back at these lines.

Troubadour (*trō'ba-dōr*), the name given in southern France, Spain, and Italy, to a class of poets who were distinguished from the minstrels and strolling musicians by the fact that they indulged in verse making for the love of it, and not for money. In northern France, they were called trouvères. They were often attached to the courts, and were attended by minstrels or "jongleurs," who accompanied them on musical instruments, as it was usually considered beneath the dignity of a troubadour to be his own fiddler. The troubadour poetry consisted mostly of love songs, though they sometimes touched upon the wars of the period or ventured to upbraid the evil customs of the times. At court festivals there were often several troubadours, who engaged in verse contests on subjects suggested by the ladies of the court. They flourished for about 200 years, from 1090–1290. Among the best-known troubadours are Richard the Lion-hearted, Pierre D'Auvergne, and Pierre Vidal, while the counts of Provence and of Toulouse, the kings of Aragon and of Castile, King Richard, and Eleanor, queen of Henry II., are among their most illustrious patrons.

Trout, the name for a number of fresh-water fishes belonging to the same family as

TROUT.

the salmon. The latter is also usually embraced under the name trout. They live in cold, clear streams and lakes, and are among our best food fishes. They are naturally inhabitants of the northern hemisphere, but have been introduced into New Zealand and Australia. The common river and lake trout of Europe are black-spotted varieties, and reach a larger size than the American river trout. Two kinds found in the United States are worthy of especial mention, the lake trout and the brook trout. The former is also called Mackinaw trout. It inhabits the Great Lakes, and other lakes from New Brunswick to Montana, and north to British Columbia and Alaska. It reaches a length of three feet or more. The brook trout, with its minute scales and beautiful red spots, is one of the most exquisite fish in appearance to be found anywhere, and it is unsurpassed as a food fish. It ranges from Maine to Dakota, always in cold streams. Its length is from five to twenty inches and it reaches an extreme weight of eleven or twelve pounds. The trout west of the Rocky mountains embrace the only black-spotted trout native to the country. Some of them live in warmer streams than their eastern relatives. The rainbow trout is black-spotted and approaches nearly to the European river trout. The latter, with some other forms, have been introduced into the waters of the United States.

Trow'bridge, John Townsend, American novelist, poet, and editor, was born at Ogden, N. Y., Sept. 18, 1827, and was partly educated at a classical school at Lockport, N. Y. Early in life, he lived on a farm and occasionally taught school, and in 1847 he went to New York and began to write for the press. He removed to Boston and there contributed to magazines and journals and took actively to authorship. His chief works are *Neighbor Jackwood*, *Cudjo's Cave*, *Farnell's Folly*, *Neighbor's Wives*, *The South and Its Battlefields*, *Three Scouts*, *Jack Hazard* series (6 vols.), *The Silver Medal* series (6 vols.), *The Drummer Boy*, *The Tide Mill* series (6 vols.), and the *Toby Trafford* series, and *Start in Life* series. He has also published, besides his popular stories, some volumes of verse, viz., *The Vagabonds, and Other Poems; The Book of Gold, and Other Poems; The Emigrant's Story, and Other Poems.*

Troy, a famous city of Asia Minor, the seat of the Trojan war, which forms the subject of Homer's great poem, the *Iliad*. It was situated, according to the poem, at the foot of Mt. Ida, in the northwestern part of Asia Minor, with a plain in front stretching for nine miles, called the Plain of Troy. The city was also called Ilium. Paris, the son of King Priam of Troy, carried off Helen, the wife of the king of Sparta, and the most beautiful woman of her age. The Greeks, after spending ten years in collecting a fleet of 1,186 ships, and an army of 100,000 men led by Agamemnon, drove the Trojans into their city, and after a siege of ten years the city was destroyed. In the tenth year of the siege, occurred the quarrel between Agamemnon and Achilles which is the subject of Homer's poem, and which so weakened the Greeks that they were driven back to the sea. Virgil, in his *Æneid*, tells the story of the wooden horse filled with warriors, left before the walls of Troy by the apparently retiring Greek army, which was drawn into the city. The warriors, thus introduced, opened the city gates to the returning army, and Troy was taken by stratagem about 1184 B. C. After the fall of Troy a new city sprang up, called New Ilium, which occupied the site of

Hissarlik, about four miles from the mouth of the river Mendereh, now believed to be the Scamander river of the *Iliad*. This spot has been excavated by Dr. Schliemann and the remains of a great city found, thought to be those of ancient Troy. See SCHLIEMANN. See *Troy and Its Remains*, by Henry Schliemann.

Troy, a city of New York on the Hudson river, six miles north of Albany, is at the head of the steamboat navigation of the river. There is a large dam across the Hudson, which, with two small streams coming from the hills back of the city in a series of falls, furnishes a large water-power. It is connected with lakes Champlain, Ontario, and Erie, by canals. Among its public buildings are the city hall, orphan asylums, Earl crematory, athenæum, and the union station, one of the finest in the country. The city annually expends the sum of $144,220 on its public schools, which have a force of 211 teachers, and an attendance of 6,357 pupils. Troy Female seminary, established in 1821, was one of the first institutions of the kind in the country, and is still successfully maintained. The Ranssalaer Polytechnic institute and St. Joseph's Theological seminary are among its schools. The principal manufactures are of iron, its factories and furnaces being the largest in the eastern part of the Union. It manufactures bar iron, railway spikes, nails, screws and bolts, stoves, furnaces, hollow ware, and machinery. It has the largest factory of mathematical instruments in the country, and the shirt and collar factories are very extensive. The old Vanderheyden house, built in 1752, was the first house on the site of Troy, and the place was known as Vanderheyden's Ferry and Ferryhook until 1789, when it was named Troy. It has been almost destroyed by fire three times. Population 60,651.

Truf'fles, the common name of certain edible fungi, belonging chiefly to the genus *Tuber*. They are nearly all subterranean and appear as tuber-like bodies developed on a mycelium. Truffles are among the most prized of the edible fungi and are chiefly cultivated in Europe. See ÆCIDIOMYCETES.

Trum'bull, John, an American painter, was born at Lebanon, Conn., June 6, 1756. He graduated at Harvard college, and studied his art at Boston. He served in the army during the Revolutionary war as adjutant of the first Connecticut regiment, aid-de-camp to Washington, major, and colonel, resigning in 1777. While studying painting in London, in 1780, he was imprisoned for eight months during the excitement produced by the execution of André. His first American historical pictures were *Battle of Bunker Hill*, and the *Death of Montgomery*. He painted portraits of Washington and other Revolutionary characters. In 1817, he was employed by congress to paint four pictures for the rotunda of the capitol, and chose for his subjects, *Declaration of Independence*, *Surrender of Burgoyne*, *Surrender of Cornwallis*, and *Resignation of Washington*. His historical paintings, numbering fifty-seven, were given by him to Yale college, and are valuable as collections of portraits of the prominent actors of the period. He died at New York, Nov. 10, 1843. See *Autobiography*.

Trum'bull, Jonathan, an American statesman, was born at Lebanon, Conn., Oct. 12, 1710. A graduate of Harvard college and a theological student, he was turned aside into business by the death of his elder brother. He became a member of the general assembly of Connecticut in 1733, speaker in 1739, and assistant in 1740, being re-elected twenty-two times. He was chief judge of the superior court for three years, and governor of the colony for fourteen years. He was prominent in the opposition to England before the Revolutionary war, refusing to take the oath to support the Stamp Act, and his advice was sought by Washington, who looked upon him as one "of his main pillars of support." The name "Brother Jonathan," given to the United States, is attributed to Washington's frequent remark, alluding to Trumbull, "Let us hear what Brother Jonathan says." He died at Lebanon, Conn., Aug. 17, 1785. See *Life*, by Stuart.

Trum'bull, Lyman, American jurist and senator, was born at Colchester, Conn., Oct. 12, 1813, and died at Chicago, June 25, 1896. He studied law in Georgia and was admitted to the bar, and settled in Belleville, Ill., where he was elected to the state legislature, became secretary of state, and in 1848 was elevated to the bench of the Illinois supreme court. In 1854, he was elected to congress, and in the following year he became a member of the United States senate. During and after the Civil war he was a prominent Republican, acting earnestly with that party, favoring the abolition of slavery and opposing the impeachment of President Johnson. He subsequently supported the Democratic party, and in 1880 was Democratic candidate for the governorship of Illinois.

Trum'pet, a musical wind instrument, of great antiquity. In its modern form it is a tube eight feet long having a bell-shaped end and doubled up in a long curve, about three feet long, and is played from a mouthpiece. It has a range of over two octaves. It has been used in war, and is a common instrument in military bands.

THE EAR TRUMPET is an instrument which collects the waves of sound and carries them to the ear, thus enabling a deaf person to hear better. The small end is placed at the ear and the large end is open to the air or placed at the mouth of the person speaking.

THE SPEAKING TRUMPET is a straight tube with a mouthpiece, which collects the sound waves, so that the voice of a person speaking into it is louder, and the sound is carried farther.

Trum'pet Flower, a popular name for a vine with a woody stem and clusters of scarlet flowers shaped like a trumpet. It grows to a great height and very rapidly, and is found in the central and southern states of the Union, where it is often called trumpet creeper. Other varieties from China, Japan, Australia, and South America are cultivated in gardens and greenhouses.

Tsad or **Tchad** (*chad*), a lake in central Africa, about 150 miles long and 120 miles wide. Two large rivers flow into it, but it seems to have no outlet, though there are signs of an ancient river bed, bordered by trees, in which the Arabs say water flowed for one hundred miles during a flood in 1870. There are populous villages on the shores, and the many islands in the lake are densely peopled by Pagan tribes, dark brown or black, with regular features, wearing cotton garments, and cultivating cotton and corn.

Tschaikovsky (*chī-kof'skī*), **Peter Ilitch,** a distinguished Russian composer, was born at Votkinsk, province of Vyatka, April 25, 1840, and died at St. Petersburg, Nov. 7, 1893. Early in life, he held a government post in the Russian service, but this he abandoned in 1862 to study music in the conservatory of music at St. Petersburg, where he was instructed in harmony and counterpoint by Zaremba, and in composition by Rubenstein. After graduating he was for a number of years professor at the conservatory of music at Moscow, where he composed many melodies gathered from the airs of the folk-songs of his native country and characterized by weird and plaintive music. Among his compositions are overtures, symphonies, concertos, marches, and operas, many of which are of great sweetness and beauty. In 1889–90, he visited London, appearing there at Philharmonic concerts, and in 1891 he came to New York, at the invitation of the New York Symphony society, where he gave renderings at the Carnegie Music hall of many of his own compositions.

Tset'se, a two-winged insect slightly larger than the common fly inhabiting some portions of South Africa. Its bite is usually fatal to the ox, horse, and dog, but harmless to man, the goat, and wild animals living in that region. It lives by sucking blood, but its bite is not immediately fatal, the bitten animals sometimes lingering for weeks and months. It is so local in its distribution, that it is sometimes seen in swarms on one side of a river, while cattle are grazing undisturbed on the other.

Tu'ber, a form of underground stem, which is much thickened by food storage, as the common potato. It usually shows its stem nature by bearing minute leaves (scales) or buds, as the "eyes" of the potato. Also the name of the genus of Fungi to which the truffles belong.

Tube'rose, a plant which belongs to the same family as the amaryllis, having a bulbous root, long slender leaves, and a cluster of very fragrant white wax-like flowers, growing at the end of a stalk two or three feet long. The bulbs were brought at first from Holland and Italy, but are now raised in the United States, those grown in Georgia and Florida being larger than the imported ones. It is a tropical plant, probably a native of the East Indies or Mexico.

Tu'bingen. See UNIVER'SITY OF.

Tuck'er, John Randolph, American lawyer and statesman, son of Henry St. George Tucker, was born at Winchester, Va., Dec. 24, 1823, and died at Lexington, Va., Feb. 13, 1897. He was educated at the University of Virginia, studied law, and was admitted to the bar in 1845, and from 1857 to 1863 was attorney-general for his native state. The Civil war dispossessed him of this post, but he was appointed to the chair of equity and public law in Washington and Lee university and held that office four years (1870–74). From 1874 to 1887 he was member of congress, and acted frequently as chairman of the judiciary committee and of the committee on ways and means, and took an active part in the congressional debates on the tariff. His oratory was frequently listened to in the house on many other important topics and themes of legislative import.

Tuck'ermann, Henry Theodore, an American writer, was born at Boston, April 20, 1813. He spent several years in Italy in the study of art and literature. His works appeared mostly as contributions to periodicals. They include *The Italian Sketchbook; Sicily, a Pilgrimage; Thoughts on the Poets*, translated into German; *Artist Life, or Sketches of American Painters; Book of American Artists;* a volume of poems; and several volumes of essays. He died at New York, where he resided for many years, on Dec. 17, 1871.

Tucson (*tū-sōn'*), the largest city in the territory of Arizona, is about sixty miles north of Mexico. It is 2,520 feet above the sea, in the valley of the Santa Cruz river. The old part of the town looks like a Mexican city, with plazas, narrow streets, and adobe houses, but the newer parts are American. The climate, mild in winter, is very hot in summer, and the yearly rainfall is only seven inches. The church of St. Xavier, built more than a hundred years ago by Catholic missionaries, is near the city, and the university of the territory is situated

here. The city is supplied with gas and water, and has a large trade with Mexico and in supplying the Indian reservations. Tucson was a Mexican military post, and came into the possession of the United States by the "Gadsden purchase," in 1853. Population 7,531.

Tu'dor, the name of one of the royal families of England, reigning from 1485–1603. The family came from Owen Tudor, at one time a brewer in Anglesey, who fought at Agincourt, and so pleased Catharine, widow of Henry V., by his dancing at a court pageant, that she married him privately. The queen took refuge in a convent and Tudor was sent to prison to escape the popular fury when their marriage became known. Tudor escaped and was protected by the young king, Henry VI. The oldest son of this marriage was made earl of Richmond, and married Margaret Beaufort, who was a descendant of John of Gaunt. Their son Henry became Henry VII. of England, and by marrying the daughter of Edward IV. united the houses of York and Lancaster, and ended the Wars of the Roses (1455–85). There were five Tudor sovereigns—Henry VII., Henry VIII., Edward VI., Mary, and Elizabeth. See *Early Tudors*, by Moberly; *History of England* (*1529–88*), by Froude.

Tufts College, a college controlled by the Universalist denomination, is located four miles from Boston. It comprises the college of letters, divinity school, medical school, and dental school. It has 120 instructors and 800 students.

Tuileries (*twē'le-riz*), **Palace of the,** a famous domicile of French royalty, now destroyed, in Paris, on the right bank of the Seine, and adjoining the Louvre. The site was originally a tile field, whence the origin of the name (the word *Tuilerie* signifying a tile kiln). The palace was commenced in 1654 as a residence for Catherine de Medici, and was enlarged by Henry IV. and by Louis XIV.—the grounds attached being converted into ornamental gardens. When the palace of Versailles was erected, the Tuileries ceased to some extent to be used by the French kings. In the revolution of 1792, it was stormed and sacked by the frenzied Paris mob, and became for a time the seat of the national convention, which governed France after abolishing monarchy. The Tuileries were also attacked and taken in the insurrections of 1830 and 1848, and during the Commune, in 1871, the buildings were burned, the ruins not being removed till twelve years later. Nothing of the palace now remains, except the pavilions which flanked it, and which, in their restored order, terminate the two galleries or extended arms of the Louvre.

Tu'la, a city in Russia, on the Upa river, 110 miles south of Moscow. It has a large cannon factory and manufactory of arms, founded by Peter the Great, and nearly 800 other factories which supply the Russian army with arms. Cutlery, locks, tea urns, and bells are made in large quantities, and the preparation of bristles for market is a large industry. Population 111,048.

Tu'lip, species of *Tulipa*, a genus of the lily family, and native to Central Asia. They are extensively cultivated for their beautiful flowers, and over 1,000 garden varieties have been catalogued. Haarlem, in Holland, is the chief source for tulip bulbs. In the 17th century the cultivation of tulips became a mania in Holland, and enormous prices were often paid for single bulbs of some rare variety.

Tu'lip Tree, the well-known *Liriodendron Tulipifera*, a member of the magnolia family, and most commonly but wrongly known as poplar. It is one of the most magnificent forest trees of the United States, with a noble shaft, great crown, broad and lobed leaves, and tulip-like flowers. It is the source of the so-called "poplar" lumber of commerce.

Tulloch (*tul'ok*), **John,** D. D., a Scottish theologian and author, and principal of St. Andrews university, was born in Perthshire, June 1, 1823, and died at Torquay, Devon, Feb. 13, 1886. He was educated at Edinburgh and in Germany, and was one of the leaders of liberal thought in theology in his time. His writings embrace a Burnett prize essay entitled *Theism, the Witness of Reason and Nature to an All-Wise and Beneficent Creator; Leaders of the Reformation; English Puritanism and its Leaders; Rational Theology and Christian Philosophy in England in the 17th Century; The Christ of the Gospels and the Christ of Modern Criticism; Modern Theories in Philosophy and Religion; Movements in Religious Thought in Britain in the 19th Century;* besides several volumes of sermons and an inspiring book for young people, entitled *Beginning Life*. He visited the United States in 1874. See *Memoirs*, by Mrs. Oliphant.

Tum'bleweed, the popular name of various annual plants which have a bushy branching habit and become more or less globular in outline by the curving of the branches. Being shallow-rooted, in light soil they are caught by the wind and tumbled along, sometimes being carried for many miles, and scattering their seeds by the way. They belong to the prairies and great plains of this and other countries. One of the most common of the tumbleweeds has recently been imported into this country under the misleading name of "Russian thistle." It is not a thistle, but a prickly member of the goosefoot family (*Salsola kali tragus*). It first appeared on the plains of Dakota and has spread extensively.

Tu'nicates, an interesting group of marine animals, surrounded by a tunic from which their name is derived. They embrace animals called sea squirts on account of their ejecting little jets of water from their terminal openings when irritated. They were formerly classified with worms, or between the worms and the mollusks. In 1866, however, Kovalevsky, by observing their development, showed that in early stages they came near to the structure of the tadpole or a frog. Moreover, the steps in their development were shown to agree fully with those of the lowest recognized vertebrate, Amphioxus. The adult animals are fixed or sessile. The larvæ are free swimming, and in some particulars on a higher plane than the adults. They have, for example, a gristly rod, or notochord, in the back of the body, and above this a nerve cord in the same position as in vertebrated animals. They also possess gill clefts. The notochord and dorsal nerve cord disappear in the adult, but their presence in the larva makes it necessary to advance the tunicates into the vertebrated group, and it is now recognized that the possession of a notochord, a dorsal nerve cord, and gill clefts mark the vertebrated animals and distinguish them from all others. The work of Kovalevsky was epoch-making, because it broke down the barrier that was supposed to exist between vertebrates and invertebrates, and opened the way for considering their affinities in an unbiased spirit. The tunicates are ovoid, or barrel-shaped, animals attached at one end to stones, weeds, or other objects. The free end has two openings through one of which water enters and, after circulating through the gills, passes out of the other. They afford an illustration of degeneration in development. When free swimming in their youth, they are on a higher level but soon become attached and, losing some of their organs, undergo retrograde development.

Tu'nis, one of the Barbary states in northern Africa, a French Protectorate, is on the Mediterranean between Algiers and Tripoli. It is 440 miles long and 115 miles broad, covering 50,840 square miles. The coast line is irregular, and there is one river, the Mejerdah. Cape Blanco and cape Bon on its northern coast are the most northern points in Africa. The northwestern part of the country is mountainous, some of the peaks being 4,000 or 5,000 feet high. The country is very fertile, and wheat, barley, corn, oranges, olives, figs, etc., are produced abundantly, olives being especially cultivated for the oil. The sheep are famous for their wool, and the horses and dromedaries are celebrated, while great herds of cattle feed on the plains. There are fine mineral springs, and silver, lead, copper, and salt are found. The trade of the country is mainly with the interior of Africa, from which are brought gums, ostrich feathers, gold, and ivory for European countries. The people are Arabs, with a mixture of Turks, Moors, Jews, and Christians. The religion is Mohammedanism. Under the Romans, the region of Tunis was about the same as that of ancient Carthage. It was conquered by the Vandals in the 5th century, by the Greeks in the 6th century, and by the Arabs in the 7th century; was invaded by France in 1270 and by Charles V. of the empire in 1535; became subject to Turkey in 1575; and, since 1691, has been ruled by beys, the descendants of Ben Ali Turki, a vassal of the Porte. The rule of the bey is only nominal, however; for a treaty made with the French in 1881 placed the country under the protectorate of France. In 1898, there were 117 French schools and 613 Mohammedan schools, besides private institutions, and a Mohammedan university. Piracy was very common until 1816. The later rulers have suppressed the slave trade and burdensome taxes, established courts of justice, and provided a city government for the capital. Population 1,900,000.

Tu'nis, the capital of the state of Tunis, in Africa, is near the mouth of the river Mejerdah, about three miles from the ruins of Carthage. It has a wall five miles around and a strong castle. The streets are narrow and dirty, and the houses of one storey, with no windows on the outside. The bey's palace and some of the mosques are very fine buildings, and the bazaars are attractive. There is a Moorish college, a Roman Catholic church, a Greek church, an Italian theatre, and large barracks. By means of a canal, opened in 1893, Tunis is accessible to ocean commerce. The manufactures are of silk, wool, leather, soap, wax, and olive oil. Population 153,000.

Tun'nel, an underground passage dug out without removing the earth above it. Tunnels are dug under bodies of water, and through mountains when the passage over or around would be less economical or less convenient. They may also be made under roads and streets for convenience of passage. The digging or boring of tunnels presents many different problems, depending on the character of the soil. In a mountainous country the operation usually involves drilling and blasting rock. Water is nearly always met with, particularly under rivers and lakes, and the methods of the pneumatic caisson have to be used. Most tunnels have to be lined with timber or masonry arches, to keep the roof and sides from caving in, and a common method is to carry forward with the digging a steel tube as lining for the excavation. The cost of tunneling has decreased greatly within a few years, owing to the introduction of special machinery for drilling and excavating. The number of large tunnels is now so great that it is impossible even to list them. The most notable ones in Europe are the Mt. Cenis, eight miles long, costing $15,000,000; the St.

Gothard, nine miles long, cost $12,000,000; and the Simplon tunnel, 12.3 miles long, cost $14,000,000. The Hoosac tunnel, on the railroad from Boston, Mass., to Troy, New York, is 4¾ miles long. It was seventeen years in construction, and cost $11,000,000. Other notable American tunnels are the Grand Trunk railroad tunnel at Port Huron, Mich., under the St. Claire river, the Chicago water supply tunnel, four miles out under Lake Michigan, the Sutro tunnel at the Comstock mines, Nevada. The Hudson river tunnel planned to connect Jersey City and New York city has been abandoned for lack of funds, after about half the distance had been bored. Among the notable recent tunnels are those bored by the Southern Pacific railroad at Santa Margarita, Cal., so as to extend their railroad along the coast from San Francisco to Los Angeles.

Tun'ny, a fish of the mackerel family, found in the Atlantic ocean, and especially in the Mediterranean sea. It is a very large fish, from nine to twenty feet long, and weighing sometimes 1,000 pounds. It is thicker than the mackerel, dark blue, with silvery spots. The European variety is highly esteemed for food, and is caught in nets shaped like a funnel, the fish entering the wide mouth and being driven to the narrow end, where they are killed with lances and harpoons. Near Constantinople it appears in shoals so crowded that they are often taken by hand. The best tunny fisheries are in Spain, Italy, and Sardinia. The American tunny, found on the Atlantic coasts from New York to Nova Scotia, is black above and white below, and is used largely for oil, one fish sometimes yielding twenty gallons.

Tup'per, Sir **Charles,** G. C. M. G., Canadian statesman, was born at Amherst, Nova Scotia, July 2, 1821, and was educated at Edinburgh, Scotland, for the medical profession. From 1857 to 1860, having entered politics, he was a member of the executive council and provincial secretary of Nova Scotia, and from 1864 until Confederation he was prime minister. He was a strong advocate of Canadian Confederation, and in 1870 joined the Dominion cabinet, in which he held various portfolios and was one of the leaders of the Conservative party. As minister of railways and canals, he advocated the construction of the Canadian Pacific railroad, was for a time finance minister, was Canadian representative at the Fisheries conference at Washington, D. C. (1887), and in 1896 became prime minister of the Canadian Dominion. From 1883 to 1887, he was high commissioner for Canada in England. In the general election of 1896, his administration was defeated on the question of the Manitoba School Bill, and he was succeeded by the Liberal government formed by the Hon. (now Sir) Wilfred Laurier. Mr. Tupper was knighted in 1879, and created a baronet in 1888, and is now leader of the (Conservative) opposition in the Dominion house of commons. His son, Sir C. Hibbert Tupper, born in 1855, was minister of justice and attorney-general for Canada, 1895–96. He is a member of the Canadian house of commons, representing Pictou, Nova Scotia. In 1892, he was created a K. C. M. G. for services rendered as agent of H. B. M. at the Paris Tribunal of Arbitration.

SIR C. TUPPER.

Tup'per, Martin Farquhar, an English author, was born at London, July 17, 1810. He was a graduate of Oxford, and was admitted to the bar. In 1838 he published his *Proverbial Philosophy*, which was very popular with the people, though ridiculed by the critics, and has passed through forty editions. His numerous works include *Crock of Gold; Hymns for All Nations, in Thirty Languages; Stephen Langton; Three Hundred Sonnets*, etc., none of which have at all equaled his first work in popularity. He died Nov. 29, 1889.

Tura'nians, one of the large divisions of the human race. It includes the Hungarians, Bulgarians, Lapps, and Finns, with other tribes in Europe; the Samoyeds, living in the northern part of Asia; the Turks or Tartars, forming the largest division; the Mongols, divided into east Mongols and Buriats; and the Mantchus, the principal race of the Tungusian branch, the present ruling people in China. Of these various tribes, those living in Europe are the most advanced in languages and customs, and those in northern Asia are the lowest of the race. The name Turanian, usually given to these related tribes, is taken from the Persians, who, calling their own country Iran, named the countries north of it Turan. They are sometimes called Mongolian, Scythian, or Tartaric races. The Turanian languages do not present the same unmistakable family likeness as the Aryan and Semitic groups, and scholars differ in regard to them, some including the Dravidian dialects of southern India, and others considering the Mongol and Mantchu dialects to be distinct languages. The Finnic branch of languages is superior to the others, having some national literature, such as the legendary and popular songs of the Finns and Hungarians. See *Science of Language*, by Max Müller.

Tur'bot, one of the flatfishes found in almost all European seas. It ranges from the Mediterranean to the coast of Scandinavia. It is

highly esteemed as food, being the best of all the flatfishes in that regard. It is a large fish, sometimes reaching a weight of seventy pounds, but that weight is very exceptional. It feeds on crabs, small fishes, sea urchins, and fish eggs. The true turbot does not occur on the American coast. An entirely different flatfish, of smaller size, is incorrectly called turbot in the United States. See FLATFISH.

Turenne (*tu-rĕn'*), **Henri de la Tour D'Auvergne,** Vicomte de, a great French soldier, was born at Sedan, France, Sept. 11, 1611. He was sent to Holland to study the art of war under his uncle, the celebrated Maurice. He joined the French army, serving in Germany, where he relieved Mainz, besieged by the emperor's army. He then was attached to the Swedish army under Bernhard of Saxe-Weimar, where he captured several towns, and later defeated the Austrians and Spaniards at Casale, and took Turin. After his conquest of Roussillon, in 1642, he was made a marshal of France and given chief command on the Rhine, when he defeated the Bavarians at Rottweil, but was himself defeated by their general, Mercy, at Marienthal. With Condé, he avenged this defeat at Nördlingen, where Mercy was slain. Turenne finished the war by conquering the electorate of Treves, and with the help of the Swedes, Bavaria, and conducted a successful campaign in Flanders. In the civil wars in France, the two greatest generals of the period, Condé and Turenne, were on opposite sides, and Turenne with inferior forces was uniformly victorious, finally driving Condé from France. He then conquered much of the Spanish Netherlands. Louis XIV. made him marshal-general of France, and only his Protestantism prevented his being appointed constable. Bossuet's celebrated *Exposition of the Christian Doctrine* was written at the king's suggestion to effect the conversion of Turenne to Catholicism, and aided by the king's solicitations was successful. In the campaign in Holland, in 1672, he compelled the elector of Brandenburg to beg for peace. His last campaign is disfigured by the devastation of the Palatinate, where he burned thirty towns. His desire to retire could not be gratified as he was the only general that could successfully oppose Montecuculi, the great Austrian general, and for nearly half a year their strategy was the admiration of Europe. Having forced his antagonist to a battle at Sasbach, Turenne was viewing the preparations for the attack, when he was killed by a stray ball, July 27, 1675. He was buried by order of the king at St. Denis, the place of the royal sepulchres. His monument was injured during the revolution, but was finally placed beside that of Napoleon in the Hotel des Invalides, in Paris. See *Life*, by Cockayne.

Turgenieff (*tŏr-gān'yef*), **Ivan,** a Russian writer, was born at Orel, Russia, in November, 1818. After studying at Moscow, St. Petersburg, and Berlin, he obtained a position in the department of the interior at St. Petersburg. On account of his Liberal ideas he was banished for a period, but was finally allowed to return to Russia. His home, however, was for the most part at Paris and at Baden. His works were many of them written in French, and have been translated into English and German. Among his best known novels are *Fathers and Sons*, *Liza*, *Smoke*, *Dimitri Rudin*, *Journal of a Useless Man*, and *Virgin Soil*. He died Sept. 3, 1883.

Tur'gor (in plants), the state of a cell when its wall is stretched by pressure of the water within it. Every active cell is normally turgid if adequately supplied with water, because the absorption of water by the protoplasm goes on until the elastic resistance of the wall balances the force (osmotic pressure) which determines the entrance of the water. The turgor varies from time to time, and in different plants, but is ordinarily equal to 3 to 6 atmospheres, and in special conditions may rise much higher.

Turgot (*tŭr-gō'*), **Anne Robert Jacques,** a French statesman, was born at Paris, May 10, 1727. He was educated for the church, and was prior of the Sorbonne in 1749. In 1752, he studied law and became councilor in parliament. He was given charge of the province of Limonsin in 1761, where he introduced many reforms, such as abolishing the method of mending the roads by the compulsory labor of the poor. He introduced the cultivation of the potato and other means of subsistence for the people. Under Louis XVI., he was put in charge of the finances of the country, which were in a terrible state of disorder. His reforms included free trade in corn in the interior of the kingdom, the doing away with the obligation to labor for the state, and substituting for general taxes a single tax on land. He reduced the expenses of the government, and introduced exactness and faithfulness into the service. If his plans had been received with favor by the nobility and statesmen, France might have been spared the horrors of the Revolution. But the combination against him was so strong that the king yielded, and Turgot retired after twenty months of service. Among his writings are, *Reflections upon the Formation and Distribution of Riches*, and a work on *Usury*. In writings on the American war, his views of the nature of colonies have since been generally adopted. His Latin inscription for the portrait of Franklin is celebrated, "*Eripuit coelo fulmen, sceptrumque tyrannis*" (He snatched the thunderbolt from heaven, and the scepter from tyrants). Turgot died at Paris, March 20, 1781. See *Life*, by Say.

Turin (*tu'rin*), a city in northern Italy, once the capital of the kingdom, is seventy-

five miles southwest of Milan on the Po river. It is one of the handsomest cities in Europe, famed for its beautiful squares, fine bridges, and pleasant promenades. Among the squares are the piazza San Carlo, with a statue of Emanuel Philibert of Savoy; the piazza Vittorio Emanuele (Victor Emmanuel), the finest square in Europe; and the piazza Castello, in which is the royal palace, with its fine library and armory, the old palace of the dukes of Savoy, the military academy, and the theatre. There is a fine five-arched bridge across the Po, begun by Napoleon with money obtained from the offerings at the cathedral, and finished by the kings of Sardinia, and a beautiful single arched one over the Dora. The cathedral, built in the 7th century, is the oldest church, and that of San Filippo the handsomest. The university, founded in 1404, has 68 teachers and 2,551 students, and has a large library, including that of Cavour, which was bequeathed to it. The Academy of Science has the finest Egyptian museum in Europe The manufactures are woolen and silk goods, jewelry, paper, pottery, pianos, and carriages.

Turin was settled by the Taurini, a Ligurian tribe. Hannibal sacked the city after crossing the Alps. In 166 B. C., it became a Roman colony, and on the fall of the empire went to the Lombards. Charlemagne made it the residence of the duke of Susa; and in 1032 it became the possession of the house of Savoy. The French held it for sixty years from 1506, and again in 1640, and in 1800 it was united to the French empire. In 1815, it was restored to Savoy, and was the capital of Sardinia until 1860, and of Italy until 1865. Population 359,295.

Turkestan (*tŏr-kĭs-tăn'*), (the country of the Turks), is a country in Central Asia, lying between the Russian dominions on the north and Persia and Afghanistan on the south. It is divided into western and eastern Turkestan by the table-land of Pamir, called the "roof of the world," which is about 15,000 feet high. Western Turkestan, once called Independent Tartary, consists of the great plain of the Caspian and Aral seas and the hilly districts on its eastern border, formed by the western branches of the Hindu Kush mountains. Eastern Turkestan, called also Chinese Tartary, includes the country east of the table-land, reaching to the desert plains of the Gobi. The Oxus, Jaxartes, and Zerafshan rivers flow westward from the Pamir table-land, while the Yarkand and Kashgar are the most important rivers flowing eastward. The higher mountain districts give fine summer pasturage for flocks, and the upper valleys and plains are fertile and highly cultivated; but toward the Aral and Caspian seas there are large regions of sandy and trackless wastes, many of them lower than the sea, where the wells are salt, and both salt and sulphur are found. The portion of eastern Turkestan near the Pamir table-land is mountainous, and the center is a great plain, with fertile belts along the streams, but most of the country is a desert, except where it is irrigated. Gold, silver, iron, copper, niter, sulphur, asbestos, agate, and jasper are found; while the field products are cotton, rice, wheat, hemp, flax, barley, corn, tobacco, and most of the common fruits. The great article of export is cattle. Manufactures of silk and cotton goods, sabers, and knives exist. In western Turkestan the people are Turks or Tartars, and Tajiks or Aryans. They are also divided into the settled population and the nomad or wandering tribes. The religion is Mohammedanism. The people are jealous of foreigners, so that the country has been very difficult of access by Europeans. The inhabitants of eastern Turkestan are varied, the Turanian element being the most prominent. The villages are a collection of walled inclosures, surrounding houses and gardens.

Turkestan has had an important part in Asiatic history. Most of the western part belonged to the Persian empire, and many of its large cities were built by the Persians. It went with Persia into the hands of the Macedonians, part of it becoming a Greek province. In the 8th century, the Arabs had possession, and it was finally overrun by the Mongol hordes of Genghis Khan. Under Timur it was the center of a great empire, stretching from Moscow to the Ganges and from Hellespont to China; its cities were adorned by the spoils of victory, and colonies of learned men and skilled artisans were brought to the country. The empire was split into fragments on the death of Timur's youngest son, and various independent states were formed out of what is now Turkestan. In 1792, the present Uzbeck dynasty obtained the throne. The later history of Turkestan is a series of wars between Bokhara, Khiva, and Khokan, of raids of the Turkomans along the Persian border, and of the progress of Russian conquest from the north and west. The Pamir table-land separates the acquisitions of Russia and England in Asia, and both countries have been contending for Turkestan, but so far Russia has succeeded in obtaining control of the larger part of the country, thus forming the Russian general government of Turkestan, with an area of 257,134 square miles and a population of 3,898,076. Population of the whole country 4,478,000.

Tur'key, a large bird related to the pheasants, and originally inhabiting the New World. There are three species known, the North American bird, the Mexican, and that of Central America. The common wild turkey of North America ranges from southern Canada to Florida and Mexico. It is about four feet long, with a glossy copper-colored plumage; a beard-like tuft hangs from the neck of the male. The Mexican turkey is

slightly different. It was domesticated by the Indians before the discovery of that country, and is the original from which the domesticated birds are descended. It was introduced into Europe in the 16th century. The turkey of Central America excels all others in variety and splendor of plumage, which combines metallic, green, blue, black, yellow, and red. It lives in the open forest and the open country, rather than in the deep forests, like the wild turkey of North America. The male has no tuft on the neck.

Tur'key Buzzard, a bird belonging to the group of the New World vultures. It is abundant in the warmer parts of North and South America, and ranges throughout the United States, except in New England. This bird is about twenty-seven to thirty inches long. It has a dark plumage, with a violet and greenish luster on the upper parts. The bill is white, and the head and upper parts of the neck, which are destitute of feathers, are reddish. It feeds on carrion. See VULTURE.

Tur'key or **The Ot'toman Empire,** consists of those countries in Europe, Asia, and Africa under the control of the sultan, though it is usually limited to Turkey in Europe and Turkey in Asia, called Turkey proper. Including all subject states, it covers 1,579,982 square miles, and has a population of 39,900,913. Turkey in Europe has been reduced to a territory stretching from the Black sea to the Adriatic, from the Ægean sea and Greece on the south to the Balkan mountains, and north of them to about 43° north latitude, covering 65,752 square miles, with a population of 6,086,300, made up mainly of Turks, Greeks, Bulgarians, and Albanians. Turkey in Asia covers 650,394 square miles, with a population of 17,545,300, consisting of some 4,000,000 Arabs, besides Turks, Greeks, Kurds, Circassians, Armenians, and Jews. It stretches from the Black sea to Arabia and the Mediterranean sea, and from the Ægean sea to Persia. A part of Bulgaria, Samos, Tripoli, and Egypt are Turkish dependencies. Turkey proper has a great extent of coast line, broken by bays, gulfs, and islands, with many fine harbors. The Dead sea in Palestine and Lake Van in Armenia are among its many large salt lakes. The Balkan mountains, the Taurus and Anti-Taurus ranges, and the Syrian mountains are among its principal ranges, while a large part of European Turkey is mountainous, and in Asiatic Turkey elevated plains abound.

The winters are cold in the mountainous districts, but warm in the sheltered valleys, and the summers very hot, especially in Syria and Asia Minor. Very little rain falls from April to September, and many plains need irrigation to be cultivated. The highest peaks reach the region of perpetual snow. The minerals of the country are copper, lead, alum, silver, emery, niter, iron, and coal, though much of the mineral resources are still undeveloped. In European Turkey, the rose is extensively cultivated, and the attar is an article of commerce. The trees of Asiatic Turkey, the cedar, cyprus, sycamore, mulberry, olive, fig, citron, orange, and pomegranate, differ from the fir, pine, almond, walnut, chestnut, peach, and plum trees most abundant in European Turkey. There are 250 species of birds, and many wild animals. It is a rich country with great resources, but still undeveloped. The religion of Turkey is Mohammedan, and the Koran is the law. The sultan or head of the government is looked upon as the successor of Mahomet; and his will is absolute, in so far as it is not in opposition to the Koran or the Multeka, the writings of Mahomet and his immediate successors. There are 2,120 mosques in the empire, of which 379 are in Constantinople alone. Four wives are allowed by the Koran, but most of the people are too poor to support more than one wife. The Christians of Turkey, found in the Greek, Armenian, and Catholic churches, and the Protestants and Jews, are all tolerated as independent sects by the government, though often bitterly opposed to each other. The Koran and Multeka encourage public education, so that public schools have long been established in most of the prominent towns, while colleges with public libraries are attached to the principal mosques. At Constantinople there is the Great National school (Greek), founded in 1870, a university founded in 1900, an imperial art school, law, military, and engineering schools, and a naval school on an island in the sea of Marmora. The Christian communities have good institutions, among them Robert college at Constantinople, and the Syrian Protestant college at Beirut. Turkey is governed by the sultan, with two chief officers appointed by him, the grand vizier, the head of temporal affairs, and the "Sheik-al-Islam," the head of the church. There is a council, which corresponds to the British cabinet. The divisions of the country are called vilayets, sanjaks, and kazas. The present sultan is Abdul-Hamid II., of the house of Othman, and the twenty-eighth sultan since the conquest of Constantinople. All children born in the royal harem are considered heirs to the throne, whether the children of free women or of slaves, and the crown passes to the male descendants of Othman according to age. The standing army numbers about 700,000 men, and military service is required of all able-bodied Mohammedans, while all others pay an exemption tax. The navy has about fifty vessels, including eighteen iron-clad ships.

The Ottoman empire is the successor of the Byzantine empire, and was founded by Othman or Osman who conquered Nicæa and other districts, and succeeded to the power of the Seljuk sultans. Adrianople was taken in 1361 by his grandson. Mohammed II. after a siege of fifty-three days, took Constanti-

nople and ended the Byzantine kingdom, May 29, 1453. Solyman the Magnificent continued the conquests of his predecessors and brought Turkey to its highest military power. During his son's reign the Turks lost the battle of Lepanto, and, under his successors, the Turkish power was reduced by such generals as Montecuculi, Sobieski, and Prince Eugene. The loss of the Crimea and the regions north of the Black sea, the conquest of Egypt by Bonaparte, and its resulting war with France, increased the troubles of the country. The revolt of the janizaries ended with a terrible struggle and massacre in 1826. At Navarino, Oct. 20, 1827, the Turkish fleet was destroyed, and in 1829 Greece became independent. In 1840, Turkey was admitted into the political system of European states, and since that time her power has been strengthened by the alliance of other nations, as by England, France, and Sardinia, in 1854 in the Crimean war against Russia, and by the French and English in the conflicts between the Druses and Maronites at Damascus and in the Lebanon. In 1875, Bosnia and Herzegovina revolted against Turkish misrule, and a year later there were uprisings in Bulgaria, followed by horrible massacres of men, women, and children by Turkish soldiers. These atrocities aroused all Europe. On account of them, England could not now befriend Turkey, and Russia having secured the neutrality of Austria by giving her permission to occupy Bosnia and Herzegovina on certain conditions, declared war against Turkey in 1877. After a bloody contest, Plevna, the Turkish stronghold, fell before her, and the Russo-Turkish war was ended by the peace of 1878. This changed the map of European Turkey greatly. Rumania, Montenegro, Servia, and Bulgaria, north of the Balkans, becoming independent; South Bulgaria, called East Rumelia, was left to Turkey, but in 1885 it was united to North Bulgaria, while Bosnia and Herzegovina came under Austrian control. Beginning with 1885, the Armenians were subjected to the most terrible oppression by their Turkish masters, who feared an uprising to revive the ancient Armenian monarchy, and who were also determined to crush out the Armenian faith. These oppressive measures were resisted by their victims, who were at once punished by torture and death. In 1894, 1895, and 1896 a systematic massacre of the Armenians was carried out by the Turks, in which over 2,500 villages were obliterated, about 21,000 people were murdered, while thousands were left starving and shelterless. It is believed that the sultan had tacitly consented to the extermination of his Armenian subjects, which would doubtless have followed, save for the warning interposition of the Powers, compelled by the outraged public opinion of the Christian nations. The chief towns are Constantinople (population 1,125,000), Salonica (population 105,000), Adrianople (population 81,000), Smyrna (population 201,000), Bagdad (population 145,000), and Damascus (population 140,500). See *History of the Ottoman Turks*, by Creasy, and *Modern Turkey*, by Farley.

Turks, a race of people belonging to the Turanian family, who appeared first in Asia among the Tartar tribes. In the 6th century, around Turkestan grew up a Turkish empire, which was overthrown by another Turkish tribe, the Uigurs, who were the first of the Turks to possess a written language. They were driven westward by the Chinese, with whom they had been contending for centuries, and their kingdom in Central Asia was entirely overthrown by Genghis Khan. But they had already established themselves in the west of Asia, where under the Seljuks, another tribe of Turks, their possessions reached from Persia to India, between the 10th and 12th centuries. The Ottoman empire was founded in the 14th century by Othman, and the present inhabitants of Turkey are called Osmanli or Ottoman Turks. The Turkomans ("like the Turks") are the descendants of the old Seljuks, and are found in Turkestan. The Ottoman Turks, found in the Turkish empire, are more like Europeans than the other Turkish tribes, which have the broad face, high cheek-bones, and yellow skin of the Mongolians. The different tribes speak nearly the same language, and are usually Mohammedans, though the Turks on the borders of China are Buddhists, and those of Siberia, Greek Christians. See SELJUKS, and TURANIANS.

Turks and Cai'cos Islands, two groups of British islands, over thirty in all, southeast of the Bahamas and under the government of Jamaica. The largest, Grand Caicos, covers 112 square miles; and Grand Turk, 14 miles square, is the seat of government, in telegraphic communication with Jamaica and Bermuda, and has 1,883 inhabitants. The only important industry is salt raking, about 2,000,000 bushels being exported annually. Population 4,744.

Tur'meric, a name given to the roots of a plant of the ginger family. The roots, or root stocks are yellow, marked with wrinkles, and a darker yellow, or reddish brown inside, and when chewed make a yellow stain; they smell like ginger, and have a somewhat similar taste. They are used somewhat in dyeing, in coloring varnishes, and in curry-powder and pickles. Paper colored by turmeric is extensively used by chemists as a test for alkalies and for boric acid.

Tur'ner, Rt. Hon. Sir **George,** P. C., G. C. M. G., premier and treasurer of Victoria, and treasurer in the new Barton (Australian commonwealth) cabinet, was born at Melbourne, Victoria, in 1851, and educated at Melbourne university. In 1887, he entered politics and has held office in a number of ad-

ministrations, including the ministership of customs, of defense, of health, and has been solicitor-general. Has been a member of the Australian National Federation convention, and chairman and president of the federal Council. Address: Melbourne, and St. Kilda, Victoria.

Tur'ner, Joseph Mallord William, an English painter, was born at London in 1775. His first art work was coloring prints for an engraver. He was indebted to a Dr. Monro for encouragement in his early work by giving him the opportunity to see his fine collection of water-colors, and by buying his sketches. He studied at the Royal academy, where he exhibited his pictures, and in 1802 was elected a member, being already recognized as the first landscape painter of his time. His style was afterward changed by travel in Europe, and in the last few years of his life, as some physicians believe, by a change in his eyes, which cast the blue mist, so characteristic of his later works. He contributed 259 pictures to the Royal academy, and over 19,000 drawings and sketches were mounted and arranged by Ruskin. His illustrations of the poems of Rogers, Byron, Scott, etc., are well known. Among his paintings are, *Dutch Boats in a Gale*, *Falls of the Clyde*, *Sun Rising through a Mist*, *Building of Carthage*, *Bay of Baiæ*, and *Childe Harold, or Modern Italy*. His most famous drawings are, *Rivers of France*, *Rivers of England*, *Scenery of the Southern Coast*, etc. They were carefully prepared by him for engraving, and all his pictures were engraved during his lifetime. Ruskin, in his *Modern Painters*, did much to raise Turner to the high position he holds among English painters. He was very eccentric, traveling alone, and hiding himself for months under an assumed name, and had a strong passion for money. He died Dec. 19, 1851, at Chelsea, leaving to the nation his collection of pictures, which have been placed in the National gallery, London. His large fortune was left to found a home for needy artists, but some defect in the will prevented the carrying out of his wishes. He was buried beside Sir Joshua Reynolds in St. Paul's. See *Life*, by Thornbury, and *Life*, by Hamerton; *Modern Painters*, by Ruskin.

Tur'ner, Sharon, an English historian, was born at London, Sept. 24, 1768. He was an attorney by profession, but continued his literary studies, and published a *History of the Anglo-Saxons*, in three volumes. This work was the result of years of patient collection of materials and research, and has given its author a permanent place in English literature. His other works are a *History of England from the Earliest Period to the Death of Elizabeth*, and a *Sacred History of the World as Displayed in the Creation*. He died at London, Feb. 13, 1847.

Tur'pentine, a gum or resin which is found in various species of pine, and some other trees. American or common turpentine is obtained from the long-leaved pine, and is brought in the largest quantities from North Carolina. Venice turpentine, which is considered the best kind, is from the larch tree. The German turpentine comes from the Scotch fir, Strasburg turpentine from the silver fir, and Canada turpentine from the balsam or balm of Gilead fir. Turpentine is obtained by making a cut in the tree and catching the sap, which looks much like honey. The oil of turpentine is made from this sap by distilling, and the hard part that is left is the common yellow resin, used in making soap, etc. Turpentine hardens in the air, burns easily, and can be dissolved by alcohol or ether. The oil of turpentine is used in medicine, and in making varnishes and paints. The name comes from the terebinth tree, from which the Greeks obtained it.

Turquoise (*tur-koiz'*), one of the precious stones, is a mineral, found mostly in Persia. It is a phosphate of alumina colored by copper. It is hard and of a greenish-blue color, the finest blue being the most valuable. It is used in the east for ornamenting swords and charms and girdles, and is thought to protect its owner against disease. The finest specimens of turquoise are supposed to belong to the shah of Persia, as only the inferior varieties are allowed to be sent out of the kingdom.

Tur'tle, a general name for all those reptiles having the body inclosed between an upper shield (carapax) and a lower shield (plastron). Names like tortoise (which see), and terrapin (which see), apply to particular kinds of turtles, but the general name embraces the green turtle, famous for making soups, the loggerhead turtle, soft-shelled turtle, snapping turtle, pond turtle, terrapin, tortoise, and others. They inhabit both fresh and salt water, and some forms are terrestrial. Many kinds are sought for food. Tortoise shell is derived from the plates of the hawks-bill turtle, which inhabits the tropical Atlantic and Indian oceans.

Tur'tledove, an Old World dove represented by twenty-five or thirty species. The common turtledove, so abundant in Europe, is both wild and tamed. It is noted for its affectionate and peaceful disposition. It is a migratory pigeon of moderate size. Like other members of the group, it feeds on seeds and various kinds of grain and makes a platform of twigs as a nest. The mourning dove of the United States is also called the turtledove. It belongs, however, to a different genus from the European dove. It is about thirteen inches long, including its long tail. It is brownish olive, glossed with blue and wine colors. The plumage shows metallic reflections. It feeds upon the ground. This bird

is widely known, on account of its long mournful note, even to those who have not seen it.

Tuscaloo'sa, a city of Alabama, is on the Black Warrior river, ninety miles northwest of Montgomery. The insane asylum, with fine buildings and grounds, a college for women, and the state university, are situated here. The university endowment includes 500 acres and $300,000 from lands granted by congress. The buildings were burned in 1865 by the Federal troops, but there are now four new buildings, with Clark hall, containing the library. Tuscaloosa is in the cotton planting and also in the mineral region of Alabama, which makes it the center of a large trade. It has flour mills, cotton, shoe, and leather factories. The name of the town and river is from the Indian chief, Tuscaloosa ("Black Warrior"), who fought with De Soto. Population 5,094.

Tus'cany, a division of central Italy, formerly a grand duchy. It lies south and west of the Apennines, on the Mediterranean, covering 9,304 square miles. The northern part is mountainous, and the remainder of the state is hilly and undulating, except the coasts, which are flat and marshy. The principal rivers are the Arno, Cecina, and Ambrone, which flow into the Mediterranean. The main crops are corn, wheat, rye, and barley; cattle, sheep, and mules are raised in great numbers; olive oil, wine, woolen, silk, and straw goods are manufactured. Leghorn is the principal seaport, and Florence, the chief city, was for centuries the center of Italian literature and art, and is famous for the beauty of its situation and environs, and for its fine art collections.

Tuscany was a part of ancient Etruria (which see). With the fall of the Roman empire it went to the Lombards, and was governed by counts, under Charlemagne and other German emperors, until the latter part of the 12th century. Florence, Pisa, Siena, and Lucca were the principal of the little states into which Tuscany was divided during the struggles of the next centuries. Modern Tuscany was formed in 1569, when Cosmo de Medici became grand duke of Tuscany. Napoleon formed the kingdom of Etruria in 1801, and in 1808 made his sister, Elisa, grand duchess of Tuscany. In 1860, it became a part of the kingdom of Italy. Population 2,346,770. See *Tuscany in 1849 and 1859*, by Mrs. Trollope.

Tuscaro'ras, a tribe of American Indians, one of the Six Nations of the Iroquois family, found in North Carolina at its settlement. After difficulties with the whites, in which many of the Indians were killed or taken prisoners, a part of the tribe fled to New York, where they settled on lake Oneida, and still have a reservation in that state. In 1829, North Carolina bought the lands still held in that state by the Tuscaroras. The name means a "shirt wearer."

Tweed, the most famous river in Scotland, rises in Peebleshire, flows for about twenty miles northeast, and then in an easterly direction, emptying into the North sea at Berwick, in England. It is 95 miles long, but navigable only a few miles from its mouth. It owes its fame to its beautiful scenery, and to the historical associations. Crossing the heart of the "Borders" between England and Scotland, it has been the scene of many a deadly struggle, and its name is frequent in ballad and story.

Tweed, William Marcy, an American politician, was born at New York, April 3, 1823. He held the different offices of alderman, congressman, supervisor of the city of New York, school and street commissioner, and state senator. While commissioner of public works, in 1870, he and his followers constituting the famous "Tweed Ring," used large amounts of public funds for their own purposes. After several trials, Tweed was convicted of fraud and sentenced to twelve years' imprisonment and the payment of $12,550 as a fine. He was confined at Blackwell's Island, but his imprisonment was declared illegal by the court of appeals. Several other suits had been brought against him, and he was again imprisoned, for want of the $3,000,000 of bail required. He escaped to Spain, but was recaptured, and died in jail in New York city, April 12, 1878.

Twickenham (*twik'en-am*), a village in Middlesex, England, on the Thames river opposite Richmond. It is known as the residence of Pope, whose grotto is still to be seen and whose monument is in the Parish church. Strawberry Hill, famous as the home of Walpole, is near by, and the Orleans house, used by Louis Philippe while in England and still belonging to his family, is in the town.

Twi'light is the faint light before sunrise and after sunset, which is produced by the reflection by the atmosphere of the sun's rays when it is still below the horizon. If we had no atmosphere, we should have no light until the exact moment when the sun would rise, and no light after the sun had set. The sun must be approximately 18° below the horizon at any place before the twilight will entirely cease; so in the polar region where the sun is nearer the horizon than 18° there will be twilight all night, or rather there will be no complete night. Just what there is in the earth's atmosphere that reflects the sunlight is yet unknown. It may be dust particles, it may be minute crystals of ice, and it may be pure air itself.

Twi'ner, a plant which climbs by coiling its body in an ascending spiral about a support, as the morning-glory, hop vine, etc. In their younger parts twiners are sensitive to contact,

so that when they touch a support they curve sharply about it. The twining habit, as the climbing habit in general, is most extensively developed in the tropics. See CLIMBING PLANTS.

Ty'ler, John, tenth President of the United States, was born at Greenway, Charles City county, Va., March 29, 1790. He graduated at William and Mary college in 1807, studied law, and had a large practice soon after he was admitted to the bar. He was elected five times to the state legislature, and three times to congress. He sympathized with the states' rights party, and opposed the United States bank, protection, and all limitations of slavery. In 1825 he was chosen governor of Virginia, and in 1827 he became United States senator and was again elected in 1833. From this time he acted with the Whig party, being an active partisan of Henry Clay, and in 1840 was elected by that party Vice-president of the United States, with General Harrison as President. The death of President Harrison, a month after his inauguration, made Tyler President in 1841. His administration, at first favorable to the Whigs, was soon displeasing to them. He vetoed the bill for a United States bank, at that time a favorite project of the party. Several members of the cabinet resigned, and finally John C. Calhoun, the great Democratic statesman, was made secretary of state. The annexation of Texas in 1845, and the passing of a protective tariff law in 1842, were among the important acts of Tyler's administration. In 1861, he was president of the peace convention which met at Washington to effect a compromise between the North and South. He afterward joined the Confederate cause, and was a member of the Confederate congress at his death, which occurred at Richmond, Va., Jan. 17, 1862.

JOHN TYLER.

Ty'ler, Moses Coit, an American *littérateur*, and professor of American history at Cornell university since 1881, was born at Griswold, Conn., Aug. 2, 1835, and graduated at Yale in 1853. From 1867 to 1881 he was professor of English at the University of Michigan, and for a time was literary editor of *The Christian Union*. In 1881, he accepted the chair of American history at Cornell, and has written a *Manual of English Literature*, a *History of American Literatuer during the Colonial Period (1606–1765)*, *The Literary History of the American Revolution*, *Glimpses of England*, and a *Life of Patrick Henry*.

Ty'ler, William Seymour, an American scholar, was born at Hartfort, Penn., Sept. 2, 1810. The gift of a Greek grammar by a young minister started the boy on his career as a scholar and teacher. He graduated at Amherst college, and studied theology, but accepted the professorship of Latin and Greek in Amherst college in 1836. Besides his work in the college for more than fifty years, where he became celebrated as a teacher of languages, he is well known from his editions of Greek authors, such as *The Germania and Agricola*, of Tacitus; Plato's *Apology* and *Crito*, and Demosthenes' *De Corona;* and from his other writings on *The Theology of the Greek Poets*, *The History of Amherst College*, etc.

Ty'lor, Edward B., D. C. L., a distinguished English scholar, and professor of anthropology at the University of Oxford, was born at London, Oct. 2, 1832, and educated at the Friends' school, Grove House, Twickenham. In 1856, he took a scientific journey through Mexico, and has written the following works: *Anahuac, Mexico and the Mexicans; Researches into the Early History of Mankind; Primitive Culture;* and *Anthropology*.

Tyn'dale, William, an English reformer, was born in Gloucestershire, England, about 1484. He studied at Oxford and Cambridge, then began his translation of the New Testament in London; but his sympathy with the Reformation becoming known by his bold speech, he had to flee, going to Hamburg for a year. The first ten sheets of his New Testament were printed at Cologne, and in 1525, at Worms, two editions were published without his name. This was the first English printed copy of the New Testament. There was a great demand for it, in spite of the prohibition of the clergy and the abuse of such men as Sir Thomas More, who wrote seven books against Tyndale. The fifth edition was published in 1529, and in 1534 a revised edition came out with Tyndale's acknowledgment of his work. He also brought out a translation of the Pentateuch, or first five books of the Bible, and wrote *The Obedience of a Christian Man*. Various plots had been made to arrest him, after the first issue of his Testament, by the English government, which at last succeeded in having him taken at Antwerp, where he was imprisoned for eighteen months and then executed, by strangling and burning, at Vilvorde, near Brussels, Oct. 6, 1536. In November, 1866, a memorial to him was erected at his birthplace in Gloucestershire. The common English Testament is based on this translation of Tyndale's. See *Life*, by Demans.

Tyn'dall, John, an eminent British scientist, was born at Leighlin Bridge, Carlow, Ireland, Aug. 21, 1820; and died in Surrey, England, Dec. 4, 1893. He was educated in the public schools until he was nineteen years of age when he entered the employ of the ordnance survey. After a short teaching experience, he went to the University of Marburg in 1848, where he spent two years and took his doctor's degree. In 1851, he went to Berlin, where he made the valuable acquaintance of Magnus, Clausius, Wiedemann, and others. Returning to London in 1852, he was elected fellow of the Royal society, and in the year following was appointed professor of natural philosophy in the Royal institution, succeeding Faraday, a position which he held until 1887, when he was succeeded by Lord Rayleigh. Tyndall's earliest investigations were made at Marburg on *The Magneto-Optic Properties of Crystals.* In 1859, he began an important study of *Radiant Heat*, resulting in a classical volume published on the subject in 1872. His investigations of glacier motion were reported to the Royal society in 1856, and later recorded in several interesting popular volumes. As a skillful and brilliant lecturer on science, he has perhaps never been surpassed. Every one should read his *Heat as a Mode of Motion*, and his *Forms of Water.*

PROFESSOR TYNDALL.

Tyng, Stephen Higginson, an American clergyman, was born at Newburyport, Mass., March 1, 1800. He was a graduate of Harvard college and a prominent clergyman of the Episcopal church, successively occupying parishes at Georgetown, D. C., at Philadelphia, and at New York. Besides his great influence in the pulpit and in church work, he was editor for some time of the *Episcopal Recorder* and *Protestant Churchman*, and wrote *Lectures on the Law and the Gospel; Christ Is All; The Captive Orphan; Esther, Queen of Persia; The Prayer Book Illustrated by the Bible; Forty Years' Experience in Sunday Schools;* and *The Feast Enjoyed.* He died in 1885.

Type, the name of the metal letters used in printing. They are usually made of an alloy, called type metal, made up of lead, antimony, and tin, copper sometimes being added. The antimony gives hardness and the tin toughness to the soft lead, which is the principal metal used. A copper face is sometimes put on the type by the electrotype battery, which makes it last longer. Types were formerly made by hand, but now type-casting machines do the work. The types must be made very accurately in order to fit so exactly when placed together that they will form a solid body. To do this they are made in molds, into which the hot metal is injected. The letter to be made is cut on the end of a bar of soft steel, and then pressed into a piece of copper by the blow of a hammer, and the copper impression is fitted into the end of the mold and the metal poured in it, filling up the impression of the letter and the rest of the mold. Types are all of the same height, but of different widths, according to the letter. A full set of types is called a font, or fount, and has the letters in different proportions, as sixty of e, forty-five of t, and forty of a, i, o, u, etc. Large and small capitals, large and small italics, small letters, figures, and punctuation marks are found in a font. Types are of different sizes, called by printers nonpareil, minion, brevier, bourgeois, long primer, pica, etc. Some of the names came from the first maker of the type, and others from the first book printed with that particular kind of type, as brevier from breviary, and pica from the service of the mass called pica or pic. According to an inscription on a tablet to his memory in Mentz, Gutenberg is credited with making the first printing letters in brass, in place of the wooden types first used in printing. The first type founder in America was Christopher Saur, who cast the type used by him in printing a German Bible about 1735. A page of a daily newspaper will sometimes require 150,000 types.

Type'setting Machines. The closing years of the past century have contributed much to facilitate and advance the art of printing. Many machines have been invented to take the place of the slow, laborious, and expensive process of hand typesetting, by mechanical devices which both set and cast the type, the operator simply fingering a keyboard, somewhat as in the typewriter. The most successful of these is what is known as the linotype machine, constructed by Otto Merganthaler, of Baltimore, Md., which is now largely used by the daily newspapers of this country and of England. This machine makes the type it uses, casting the letters selected by the operator, properly "justified" with spaces between the words, in solid bars of the length of line required. "Brass matrices are dislodged by the operator instead of types, and these are automatically arranged over the mold that forms the line. When this line is full another automatic device thrusts wedges between the words and spaces out the line. At the same instant a jet of fluid metal, kept fluid by gas jets under the machine, is injected and thrown out of the mold as soon as it is cool enough, without delaying the work of the operator. The brass matrices are immediately returned to their proper receptacles for subsequent use. The performance of the machine is limited

only by the ability of the operator." The capacity of the machine is from 8,000 to 10,000 ems per hour. When each line leaves the machine it is ready to go into the page form, and casts from it may be duplicated as often as desired. Leads between the lines are inserted at the pleasure of the maker-up of the forms. With these linotypes, there is no need for distributing the type after use, in the old way, as each line of type, when it has served its purpose, is simply melted down. Other machines are patented and in use, such as the Lanston, but this casts the type it uses, not in lines, as the Mergenthaler does, but in isolated characters. For fine bookwork, especially where a variety of type, italics, small capitals, accents, etc., are required, the old method of setting up the type by hand is retained. Other more or less successful machines for typesetting are those covered by the Thorne, Rogers, Frasier, and McMillan patents.

Type'writers, machines for writing by movable types instead of the pen. In 1714, a patent was granted in England for a writing machine, and one was invented in France about 1784. The first writing machine patented in America was the Thurber machine in 1843, which worked too slowly to be of general use. Other machines followed, each one introducing improvements and new principles, until in 1873 the Remington was put into practical use. It was the result of experiments made by two printers, Sholes and Souli, whose attention was called to an article in the *Scientific American* describing a writing machine which had been invented by John Pratt, of Alabama. The first machine was finished in 1867, and was used for letter writing. One of these letters brought the new enterprise a friend, Mr. Densmore, of Pennsylvania, who joined with Sholes in perfecting the machine, until in 1873 it passed into the hands of the firm of Remington and Sons, of Ilion, N. Y. It was first used by professional men and its great advantages for business houses was not thought of until 1882, since which time it has been almost universally adopted, and many different kinds have been introduced. The types are placed on steel arms or bars, each marked with a letter, which are moved by the fingers of the operator, as are the notes of a piano. The paper is carried through by rollers and moved one space with each impression of a letter. The use of the typewriter instead of the pen is estimated to save forty minutes an hour, or over five hours in a day. It will write at the rate of thirteen letters a second, some operators writing more than a hundred words a minute. Typewriting has become a profession, and there are free classes of instruction in many public institutions in the United States.

Typhoon. See STORMS.

Tyre (*tir*), a city of ancient Phœnicia, on the Mediterranean sea. There were two towns of Tyre, one on the mainland of what is now Syria, and the other on an island opposite. It was situated in a fertile region, with magnificent scenery, and was a rich city in the days of Solomon, when Hiram, its king, furnished him with cedar trees, fir trees, and gold. It was a naval city at that time also, as it is recorded that Hiram sent to Solomon "shipmen that had knowledge of the sea," and its harbors were among the finest of the period. Carthage was founded by the people of Tyre about 813 B. C., the new colony seeming to have so weakened the old city that it disappears from history, until Shalmaneser, or Sargon, according to some writers, king of Assyria, conquers it after a long siege, and Nebuchadnezzar after a thirteen years' siege by water and by land, reduced it to only a partial submission, leaving its ruler on the throne, and its wealth untouched. The city fell before Alexander the Great in 332 B. C., who put in a new colony, under whom the city soon regained its prosperity. When under the Roman power, Tyre was given to Cleopatra by Antony. In the 7th century it came into the hands of the Saracens, until taken by the Crusaders. Its wealth, made by its trade and manufactures, especially that of the renowned Tyrian purple dye, made it a prosperous city until 1516, when the newly discovered route to Asia by the Cape of Good Hope put an end to its commerce. Its site is now occupied by an unimportant town, called Sur, with about 5,000 inhabitants, under the Turkish government of Beirût. Many of the ruins of ancient Tyre have been covered by the sea, but there are tombs found cut in the rocks, and the remains of a Christian cathedral built in 324.

Tyrol (*tir'ol*), an Austrian province in the western part of the empire, lies north of Italy and east of Switzerland. It covers 11,325 square miles, and is divided into three large valleys separated by mountain ranges — the Tyrolese or German Alps on the north, the Rhætian Alps in the center, and the Trent Alps on the south. The loftiest peaks in Austria, many of them in the region of perpetual snow, are in the Tyrol. The Brenner pass, the lowest of the great passes of the Alps, is near the center of the province and on the line of travel between Italy and Germany. The Inn, the Adige, and the Rhine on its borders, are the principal rivers. About one-third of the land can be cultivated, the rest being in forest, or in the land of snows. The crops are corn and other grains, and fruit. Goats and sheep are raised, and chamois, marmots, and eagles abound. Gold, iron, copper, and coal are found. There is a university at Innsbruck, and other schools in the country. The people are divided into the German Tyrolese in the north and the Italian Tyrolese in the south, and are nearly all Catholics. They are very patriotic, and are noted for their love of home and their national songs.

Tyrol under the Romans was a part of Rhætia. It passed back and forth from Bavaria to Austria until 1814, when Austria finally claimed it. In 1809, the insurrection under Andreas Hofer took place, in which men and women fought side by side until hundreds were killed, because their country had been given to Bavaria. Population 928,769. See *Tyrol and the Tyrolese*, by Grohman; *The Valleys of Tyrol*, by Busk.

Tzarskoge, Selo or **Sofia,** a town in Russia, fifteen miles south of St. Petersburg. It is the summer residence of the czar, and was originally a country house of Peter the Great. The palace was built in 1744. The main building is 800 feet long, with large wings in addition. The rooms are very magnificent, finished in gold, amber, lapis lazuli, and other precious materials. There is a Gothic castle, an arsenal, a smaller palace built by Alexander I., and a triumphal arch in memory of the Russian victories over Napoleon. It is eighteen miles around the grounds, and it keeps 600 persons busy to care for them. Population of the town 14,603.

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Uganda (*ū-gän'da*), a British protectorate in East Africa, extending inland and covering the region about the Equatorial lakes, Victoria Nyanza, Albert Nyanza, Albert Edward, Rudolf, Kiogo, Baringo, etc. Area estimated at 140,000 square miles, with a native population of about 3,000,000, of whom about a third belong to the civilized and Christianized Baganda race, speaking the Bantu tongue. The trade of the protectorate is in the hands of German and British trading firms, carried on by British Indians, Persians, and Arabs. The region is fertile, with a rich fauna and flora; while iron, copper, and even gold abound. The Uganda government railroad now extends for 450 miles from the coast, and is at present within 100 miles from Lake Victoria. The protectorate is divided for administrative purposes into six provinces (Eastern, Rudolf, Nile, Central, Uganda, and Western), over which order is maintained by a force of Sudenese, consisting of Uganda Rifles, an armed constabulary, and native levies to the number, in all, of 4,000 men. The territory came under British influence in 1890, and four years later it was erected into a British protectorate. It has some high mountain elevations, from 10,000 to 19,000 feet, with snow-covered peaks, glaciers, and volcanoes.

Uhland (*ō'länt*), **Johann Ludwig**, a German poet, was born at Tübingen, in Würtemburg, April 26, 1787. He studied and practiced law at Tübingen, was a professor of the German language and literature in the university there, a leader in the diet, and a member of the Frankfort parliament. His writings consist of the dramas, *Ernest of Swabia* and *Louis the Bavarian*, works upon early German and Norse literature and mythology, and the songs and ballads for which he is famous. The first collection of poems, made in 1815, were patriotic songs, called forth by the war against Napoleon, and more than fifty editions have been published. *The Castle by the Sea* and *The Black Knight*, found among Longfellow's poems, are translations from Uhland, and there have been various translations of his songs and ballads. He died at Tübingen, Nov. 13, 1862.

Uhlans (*ū'länz*), a name given to the light cavalry of the Tartars, who were brought into Europe by their colonies in Poland. They were mounted on Tartar horses, and carried only light arms, such as the saber, lance, and later the pistol. In the Prussian army, all the light cavalry are called uhlans. They were conspicuous in the Franco-German war for their bravery and agility.

Ujiji (*ō-jē'jē*), a country in central Africa on Lake Tanganyika. It is a fertile country, raising groundnuts, peas, beans, plantains, sweet potatoes, egg plants, and yams. Sugar cane, tobacco, and cotton are cultivated to some extent. The people, called the Wajiji, are large and strong, with flat feet, woolly hair, and dark skins. In the town of Ujiji, a collection of huts with a bazaar where the Arabs trade, Stanley found Livingstone in November, 1871. See *How I Found Livingstone*, by Stanley.

Ulfilas (*ūl'fi-las*), a bishop of the Goths, was born about 310, and is thought to have come from a family of Christians from Cappadocia, taken prisoners by the Goths. He was learned in the Gothic, Greek, and Hebrew languages, and made a Gothic alphabet of twenty-four characters, modeled after the Greek. He translated the Bible, all but the books of Kings, into Gothic, and his Bible was in constant use among their cities. It is the earliest specimen of the Teutonic language. He became bishop of the Goths in 341, and settled with the Christian part of the nation near Nicopolis, persuading them to practice agriculture and the arts of civilized life. He died at Constantinople in 381. See *Ulfilas, Apostle of the Goths*, by Scott.

Ulm, a city of Würtemburg, is on the Danube river, forty-five miles southeast of Stuttgart. It has one of the largest Protestant churches in Germany, one of the earliest libraries, with a remarkable collection of antiquities, and strong fortifications. Its pipe bowls are noted, and with fine flour make a large part of its trade. Ulm was an imperial city of Swabia, and in the 15th century had within its walls and in the surrounding region belonging to it, nearly 100,000 inhabitants. It suffered in nearly all the great German wars, and is the site of the defeat of the Austrian general, Mack, by Napoleon, Oct. 17, 1805. Population 39,303.

Ulysses (*u-lis'sēz*) or **Odysseus** (*o-dys'-seus* or *o-dys'seus*), a Greek hero. He was ruler of Ithaca, and feigned insanity to avoid taking part in the siege of Troy. To show that he was crazy he plowed the sand on the seashore, but Polamedes exposed his deception by placing his infant son in the furrow, when he quickly turned the plowshare aside. Unsuccessful in his mission to demand the return of Helen, he joined in the ten years' siege, being one of the most prominent of the Greek leaders. He fought with Ajax for the prize of Achilles' armor, which he gained, and was one of the Greeks hid in the wooden horse, who captured the city. On the island of the Cyclops, when six of his companions were eaten by the giant, he put out the giant's one eye, and escaped by tying himself and his companions under the bodies of the sheep, which carried them with

them when let loose from the cave. At the island of Æolus, that god gave Ulysses a bag containing the favorable winds, but the bag was opened by his followers and the winds escaping the ships were driven back to the island. Circe, the sorceress, changed part of his followers into swine, but he overcame her spells with the help of Mercury. He passed safely the island of the Sirens by filling the ears of his followers with wax and tying himself to the mast. At Trinacria, his followers, while he slept, killed some of the cattle of Helios, which they had been warned not to touch, whereupon a great storm arose, the ship was wrecked, and all on board were drowned but Ulysses. He lived seven years on the island of Ogygia with the nymph Calypso, returned at last to Ithaca after twenty years' wandering, and slew the suitors of his wife, Penelope, with the help of Minerva and of Telemachus, his son. The *Odyssey* gives the story of his wanderings.

Um'bel, a cluster of flowers in which the pedicels arise in a cycle from a common level, resulting in a flat-topped cluster. Often umbels are compound, each branch of the main cycle terminating in a cycle of pedicels bearing flowers. A cluster characteristic of the great family umbelliferæ. See INFLORESCENCE.

Umbria, a country of ancient Italy, lying between the Adriatic sea and Etruria, or Tuscany. The Tiber and the Rubicon were among the principal rivers. It was one of the most powerful states in central Italy, but was conquered by the Romans in 308 B. C. The name is given now to Perugia, a province of the kingdom of Italy.

Unalas'ka, one of the Aleutian islands, the extension seaward of the Alaskan peninsula, which separates the Pacific ocean from Bering sea. The island lies at the passageway for steamers from San Francisco, Portland, Ore., and Victoria, B. C., proceeding to St. Michaels, the mouths of the Yukon, and to Cape Nome. The chief village of the island is adjacent to Dutch harbor, and is named Unalaska, the population of which by the recent twelfth census was 428. The islanders are principally Aleuts, who support themselves by fishing; there are also a few Russians and Americans. Captain's bay, a naval rendezvous, is the sheltered waterway in front of Unalaska town. It is about 2,060 miles distant from Portland, Ore., and 2,344 miles from San Francisco.

Un'cas, an Indian chief of the Mohegan tribe, in Connecticut. The Mohegans were a band of Indians collected by Uncas after he had left the Pequot tribe, to which he belonged. He sided with the English in the war against the Pequots, and was so friendly with them that the Indians turned against him. In the wars which took place, Uncas captured and killed the chief of the Narragansetts. Several tribes made war against him, and the Narragansetts would have starved him out of his stronghold had not the English sent him supplies by night. He was called a cruel, wicked old man, but was faithful to his English allies. He died when very old, in 1682.

Ungulates (*ŭn'gu-lāts*), the name for an order of hoofed mammals. The larger proportion of mammals belong to this interesting order, which embraces the species useful to man, as the horse, ox, sheep, camel, pig, deer, etc. They all walk, so to speak, on the tips of their toes, each toe at the end being incased in a horny hoof. They are naturally divided into two groups, the odd-toed and the even-toed mammals. The former includes the horses with a single hoof, the rhinoceroses, with three toes on each foot, and the tapirs with three toes on the hind feet, and four (one of which is not used) on the fore feet. The odd-toed mammals (*Perissodactyla*) have had a long geological history, and many modifications can be traced through those found in the rocks. The horse, for example, sprang from ancestors with five toes, and between those remote ancestors and the modern horse with a single toe lies more than two and one-half million years (see EVOLUTION). The even-toed forms (*Artiodactyla*) include all those with cloven hoofs, as the cattle, deer, sheep, goats, swine, and the like. The hippopotamus has four toes on each foot. The swine has four toes, but the two outer are lifted above the ground and not of use in progression, and the cud-chewers have the toes reduced to two. These even-toed mammals have likewise a long history, and in the rocks are forms which lead up to those now existing.

U'nicorn, a legendary animal described by ancient authors as possessing the body of a horse, and a single long horn issuing from the forehead, and projecting forward. It was supposed to inhabit India. This fabulous creature became a sign in heraldry. A somewhat similar animal with cloven hoof and beard of a goat is depicted on the coat-of-arms of England. The word translated "unicorn" in the Bible refers to some horned creature. It is supposed by some scholars that the buffalo is indicated.

U'nio, the name for a number of fresh-water mussels very abundant in the United States. Their name would indicate a single shell, but they are bivalves. For their structure, see CLAM. Some forms, especially in the streams of Wisconsin, Ohio, and New Jersey, contain pearls. These animals are gathered in great numbers, but the pearls are of infrequent occurence and mostly small. Occasionally, however, those valued as high as $500 to $2,000 have been found. The shells are used for making pearl buttons.

U'nit. See MEASUREMENT.

Uni'ted States of Amer'ica, a republic of North America, lying between the Atlantic and Pacific oceans, and reaching from British America to the gulf of Mexico and Mexico. It covers 3,507,640 square miles; its longest line from east to west being nearly 2,800 miles, and the length from north to south 1,600 miles. Two great mountain ranges cross the country from north to south. The Appalachian range, comprising the White and Green mountains, Blue Ridge, Alleghanies, Adirondacks, Catskills, and Highlands, is the most eastern, running nearly parallel with the Atlantic coast from New Hampshire to Georgia, and from twenty to one hundred miles inland. This mountainous country, with peaks over 6,000 feet high, is about one hundred miles wide, forming a barrier which is broken only by the Hudson and Mohawk rivers. Mt. Washington in New Hampshire, and the Black Dome, in North Carolina, are the highest points. The Rocky mountains, the second great range, are 300 miles wide, with a much greater width at some points, and reach from Canada to Mexico, with peaks over 14,000 feet high. The Sierra Nevada, in California, the Cascade range in Oregon and Washington, and the Coast range are parts of the Rocky mountain range. Mt. Whitney, in the Sierra Nevada range, is 14,887 feet in height, and nearly as high are Mt. Hood, Mt. Shasta, Pike's Peak, Long's Peak, and others.

The Atlantic slope, between the Appalachian system and the ocean, has in general low coasts, sloping inward to the hilly regions at the base of the mountains. There are many large bays and inlets, the Penobscot, Massachusetts, Cape Cod, Narragansett, New York, Delaware, and Chesapeake bays, and Long Island, Albemarle, and Pamlico sounds being the most important. The rivers flowing into the Atlantic are many of them navigable, the larger ones being more than 300 miles long, such as Penobscot, Kennebec, Hudson, Connecticut, Delaware, Susquehanna, Potomac, James, Cape Fear, Neuse, Roanoke, etc. The Atlantic coast line is 2,349 miles long, not including the indentations of the land.

The great central plain stretching from the Alleghanies to the Rockies, and watered by the Mississippi and its branches, is one of the most fertile regions in the world. Its hills are covered with forests, and its prairies and plains produce the great crops of grain and cotton that feed and clothe the world. The eastern part of this central region is hilly, covered still in east Tennessee and West Virginia with heavy forests; the central part is prairie, merging in the west into the great plains covered with wild grass, sage brush, and cactus, with little rainfall and depending on irrigation to make it profitable to cultivate. The great rivers of this region are the Mississippi and its branches, the Ohio, Wisconsin, Illinois, Yazoo, Missouri, Minnesota, Arkansas, and Red rivers, extending many of them from 1,000 to 2,000 miles. This region is bordered by the five Great Lakes, the largest bodies of fresh water on the globe, while New York, Wisconsin, Michigan, and Minnesota are noted for their numerous small lakes and Utah for its Great Salt lake.

The Pacific slope has bold and rocky coasts, stretching for 2,281 miles, with bays at San Diego, Monterey, San Francisco, strait of Juan de Fuca, Puget sound, and the numerous bays and sounds of Alaska. It is the most varied part of the country, broken by the Sierra Nevada, Cascade, and Coast Range mountains; with heavy forests in the northern parts; great plains and high mountain valleys, 10,000 feet above the sea, descending by great steps to the lower levels; its great cañons or river beds, thousands of feet deep; its dry plains, and the great basin region, with no drainage to the sea. The rivers of this slope are the Columbia and its branches, the Sacramento, San Joaquin, and the Colorado of the West. On the southern border of the United States is the gulf of Mexico, and flowing into it are the Mississippi, Appalachicola, Mobile, Pearl, Rio Grande, and Colorado rivers, while on the northern border, connecting the Great Lakes with the ocean, is the St. Lawrence river. The total coast line of the United States, including bays and gulfs and sounds, is 22,609 miles.

Among the many interesting natural features of the country may be mentioned the Niagara and Yosemite falls; the falls of St. Anthony on the Mississippi, and those of the Missouri and Snake rivers in Montana and Idaho; Mammoth Cave in Kentucky; the Natural Bridge in Virginia; the pictured rocks on Lake Superior; the passages on the Hudson through the Highlands, of the Potomac at Harper's Ferry, of the Missouri through the Rocky mountains, and of the Columbia river through the Cascade range; the natural parks of the Yosemite and the Yellowstone; the mammoth trees of California, and the geysers.

The climate of the United States, a country stretching through twenty-five degrees of latitude, and changing from low plains to high mountains, is, of course, varied. In most parts of the land it is very changeable, with a great difference between winter and summer. The Atlantic states are colder than the same regions in Europe, while California has as mild a climate as Italy. The rainfall is abundant except in some parts of the west, and distributed throughout the year, except on the Pacific coast, where it occurs in the winter and spring. There is also every variety of soil, including the prairie lands covered with rich mould, sometimes twenty-five feet deep, and the dry, sterile plains of the Utah basin.

The minerals of the country include gold, silver, iron, lead, copper, zinc, nickel, coal,

marble, and slate, to which must be added petroleum and natural gas. In the production of quicksilver, iron, copper, and lead, the United States holds the second place among the nations of the world, while in producing gold, coal, and steel it has the first rank. In 1899, the product of gold was 3,437,210 ounces; of silver, 54,764,500 ounces; of coal, 225,835,304 tons; of iron, 13,620,703 tons; and of lead, 209,240 tons. Much of its great wealth is still undeveloped, especially in the southern states. The agricultural products of the country are enormous, and form the bulk of the exports; while nearly one-half of the laborers are engaged in agriculture. In 1899, there were produced 2,078,143,933 bushels of corn, 547,303,846 bushels of wheat, and 796,177,713 bushels of oats; and in 1900 the cotton crop of the south amounted to 4,757,062,942 pounds. Manufactures of all kinds are increasing, the eastern states particularly having become almost exclusively manufacturing states. The cheapness and abundance of fuel and of the raw material used in manufactures, and the fine water-power found so abundantly, contribute to the success of almost all manufacturing enterprises, the high price of labor being the only unfavorable condition.

The United States of America is composed of forty-five states, three territories, the District of Columbia, Indian Territory, and Alaska, besides the Hawaiian Islands, Porto Rico, the Philippine Islands the island of Guam, and the small islands Tutuila, Manua and Anu, of the Samoan group. The original states numbered thirteen, the others having been admitted into the Union since the adoption of the constitution. Each state has its own government, with a governor and legislature, making its own laws, so that the laws vary in different states. The territories are governed by a governor appointed by the President of the United States, and a legislature chosen by the people. When populous enough they become states, by vote of congress. Indian Territory, Alaska, and the District of Columbia are not territories, but districts. The District of Columbia is governed by congress; the Indian Territory by a council of delegates from the different Indian tribes; and Alaska by a governor and a United States district attorney appointed by the President, but it has no legislature and no representation in congress. The Hawaiian Islands which were annexed to the United States in 1898, were in 1900 constituted as the Territory of Hawaii. The government of Porto Rico and the Philippine Islands is administered by civil governors appointed by the President. Guam and Tutuila are practically naval stations, in charge of officers of the navy, assigned by the President.

The government of the United States is in three branches, the legislative, executive, and judicial. It is founded upon the constitution which was adopted by the thirteen original states, in 1788, and which can be altered by a vote of the people. The President is the head of the government, and with the Vice-president is elected for a four years' term, by what is called the electoral college, made up of as many electors from each state as that state has members of congress. The President is commander-in-chief of the army and navy, though never appearing at the head of the army, and appoints the heads of departments, ambassadors, judges of the supreme court, and almost all the higher officers of the government, in all about 100,000 persons. He has the right to veto a measure passed by congress, which, however, by a two-thirds vote can pass a measure over the President's veto. His salary is $50,000 a year, and he resides in the White House at Washington, D. C. To be eligible for election to the presidency, a man must be a native of the United States and thirty-five years old. Congress, the legislative or lawmaking body of the United States, is made up of two bodies, the senate and house of representatives. Each state legislature chooses two members of the senate, who serve for six years. The house of representatives is composed of 332 members, divided among the different states according to their population, and elected by the people for the term of two years. Congress has the power to make any laws that affect the whole country, but cannot change the laws of a state.

The heads of the different departments of the government are called: secretary of state, secretary of the interior, secretary of the treasury, secretary of war, secretary of the navy, secretary of agriculture, attorney-general, and postmaster-general; they are appointed by the President with the approval of the senate, and form his cabinet, or body of advisers. The supreme court of the United States sits in Washington, with nine judges appointed by the President and holding office for life. There are, besides, nine circuit courts, fifty-five district courts, and one court of appeals. The army of the United States numbers 65,000 men, with an organized militia of 106,339. They occupy 104 garrison posts. The military academy is at West Point, N. Y. The navy numbers 20,000 men, including apprentices, and is to be further expanded to 22,800 men. There are ninety-eight vessels, ten navy yards, four naval stations, and a naval academy at Annapolis, Md.

The education of the people of the United States is provided for largely by the states, each of which has its system of public schools, open to all children of school age. The national government has, however, appropriated more than 75,000,000 acres of land for schools and universities, including about 8,000,000 acres given to establish agricultural colleges in the different states. In 1898, there were 15,138,705 children in the public schools, which cost the different states $197,281,603. There were 484 universities and colleges, of which 344 were coeducational, 140 for men

only, with a total enrollment of 77,415 students; besides schools of art, music, law, medicine, theology, and mechanical arts. There is no state church, all denominations and all sects being perfectly free to worship in their own way, except where the religious rites or customs are opposed to the constitution of the country, as is the practice of polygamy by the Mormon church.

The population of the United States is 76,295,220 and has more than doubled since 1860. The original inhabitants of the country were Indians, of whom there are now 262,965 on the various reservations. The negroes or colored people were brought into the country by slavery, and now number over 8,000,000. The foreign-born population is estimated at 9,249,547, made up of almost every known nationality, immigrants numbering 18,770,307 having come to the United States. About one-third of the immigration is from Germany, one-third from Great Britain (largely Irish), one-tenth from Canada, and one-tenth from Sweden and Norway, with a small proportion of Hungarians, Russians, Bohemians, and Italians. The Chinese are the only people excluded as a nation, but convicts, lunatics, idiots, and all persons likely to become a public burden, are forbidden the country by the act of congress of 1882.

The United States obtained its vast domain of 2,308,866,560 acres by settlement, purchase, and conquest. The Norsemen are thought by some historians to have made settlements in Massachusetts and Rhode Island as early as the 10th and 11th centuries, but the continent was still unknown to Europe when Columbus sailed with his little fleet to the west, and found the western islands in 1492. Then the Cabots sailed along the coasts from Labrador to Virginia in 1498. Spain entered the region now belonging to the United States at St. Augustine in 1565, and at Santa Fé in 1598. The French occupied the Mississippi valley and the northwest, and Holland and Sweden had their colonies on the Hudson and the Delaware. The English, who were to possess the land, settled at Jamestown, in Virginia, in 1607, and at Plymouth, Mass., in 1620. The English settlers followed the Atlantic coast and westward toward the interior, gradually driving before them Indians, Spaniards, Dutch, and French. In 1803, by the Louisiana Purchase (which see) for $15,000,000, the French gave up their claims to the great country west of the Mississippi to the Rocky mountains, and from Texas to British America. In 1819, Spain ceded Florida, receiving six and a-half million dollars. The Mexican war added Texas, New Mexico, California, Nevada, Utah, and Arizona to the country, the United States paying $15,000,000 for the first cession of land, and $10,000,000 for the final yielding up of a part of Arizona, known as the "Gadsden purchase." In 1867, Alaska was bought of Russia, the price paid being $7,200,000. Washington and Oregon were preserved to the Union by the treaty of 1846 with Great Britain, which settled the northern boundary at 49° of latitude. The lands of the Indians have been obtained by war and purchase, large reservations still belonging to the Indian tribes. More than a billion acres of land have been sold for cash by the government, or given to schools, railroads, and settlers.

Besides the early Indian wars, and the struggles with other settlers, the country has carried on five wars. The War of the Revolution was brought about by the heavy taxation of the colonies by the English government to repay the expenses of the French war, by which it had obtained possession of Canada. It lasted from 1775 to 1783, when the independence of the colonies was recognized by Great Britain in a treaty of peace signed at Paris, Sept. 3, 1783. The Declaration of Independence was adopted by the vote of twelve colonies July 4, 1776, and the country was first called the "United States of America" in that document. The first battle of the Revolution took place at Lexington, Mass., April 19, 1775, and the struggle was continued for seven years, the surrender of Cornwallis' army at Yorktown, Oct. 19, 1781, practically ending the war. Great Britain sent to America in this war about 112,000 soldiers and 22,000 seamen, and lost 25,000 men, while the United States brought into the field 232,000 regular soldiers, and 56,000 militia, besides the French troops sent to her assistance.

The second war between the United States and Great Britain, called the War of 1812, arose from the seizure of American vessels at sea by the British, and their claim to the right of searching American ships for deserters from their navy. Nine hundred ships were searched and 5,000 sailors taken from them before war was declared, June 18, 1812, and began with an unsuccessful invasion of Canada. The naval battles were more successful, resulting in the capture in the first year of nearly 300 vessels. During the war, carried on for three years by land and sea, a British army landed in the Chesapeake, and captured the city of Washington, burning the public buildings. A treaty of peace, signed at Ghent, Dec. 24, 1814, ended the war, though the battle of New Orleans was fought Jan. 8, 1815, before the news of the treaty had crossed the ocean. The Mexican war, from 1846 to 1848, was brought about by the annexation, in 1845, of Texas, which had revolted from Mexico, and was ended in a treaty of peace, Feb. 2, 1848, which made the Rio Grande the boundary line between the countries, and gave New Mexico and California to the United States.

The question of the extension of slavery, which had been introduced into the country now forming the United States, as early as

1001. **Icelandic navigators visit the coast of N**
1492. **Columbus discovered America.**
1497. **Cabot discovered Newfoundland.**
1499. **Amerigo Vespucci visited America.**
1512. **Ponce de Leon discovered Florida.**

A. D.			
1600	7. **First settlement in Virginia,** at Jamestown.		
	9. Second Charter granted.		
	10. The starving time.		
	12. Third Charter granted.		
	15. Tobacco first cultivated.		
	20. *Slavery introduced.*		
	21. Cotton first cultivated.		
	22. Indian massacre at Jamestown.		
			32. **Marylan**
			34. Settled by
	44. Second Indian massacre.		
	60. Navigation Act passed.		
		64. **North C**tled.	**arolina** set
	76. Bacon's R	ebellion.	
1700			
	32. Washingt	on born.	
	65. The Stam	p Act.	
	The Virgi	nia Resolutio	ns.
	76. Norfolk b	urned.	
		80. Battle of	King's Moun
		81. Battle of	Guilford Cou
	81. Surrender	of Cornwallis	
	82. Cessation	of hostilities.	
	83. Treaty of	Peace.	
	87.	Constitution	adopted.
	89.	Washington	elected Pres

CHART VIII.

1789 **GEORGE WASHINGTON**, President.
John Adams, Vice-President.
90 Indian troubles in Ohio.
90. General Harmar defeated.
90. Capital removed to Philadelphia.
91. Vermont admitted.
91. St. Clair defeated.
91. United States Bank established.
92. Kentucky admitted.

WASHINGTON re-elected President.
John Adams, Vice-President.
93. Difficulty with Genet, French Ambassador.
94. Whiskey insurrection.
94. Wayne's victory at Maumee.
95. Jay's Treaty.
96. Tennessee admitted.

1797 **JOHN ADAMS**, President.
Thomas Jefferson, Vice-President.
98. War with France.
99. Washington died, aged 67.
99. Treaty with France.
1800. Capital removed to Washington.

1801 **THOMAS JEFFERSON**, President.
Aaron Burr, Vice-President.
1. War with Tripoli.
2. Ohio admitted into the Union.
3. Purchase of Louisiana.
3. Preble sent against Tripoli.
4. Hamilton killed by Burr.

JEFFERSON re-elected President.
George Clinton, Vice-President.
6. Burr's Conspiracy.
7. English and French restrictions on commerce
7. The Embargo Act passed.
7. Attack on the Chesapeake.
7. Fulton's first Steamboat on the Hudson.

1809 **JAMES MADISON**, President.
George Clinton, Vice-President.
11. Battle of Tippecanoe.
11. Fight between the ***President*** and the ***Little Belt***.
12. War declared against England.
12. Louisiana admitted.
12. Surrender of Mackinaw.
12. Surrender of Queenstown.

Naval Battles.

12. The ***Constitution*** and the ***Guerriere***.
12. The ***Wasp*** and the ***Frolic***.
12. The ***United States*** and the ***Macedonian***.
12. The ***Constitution*** and the ***Java***.

MADISON, re-elected President.
Elbridge Gerry, Vice-President.
13. Battle of Frenchtown.
13. Seige of Fort Meigs.
13. Perry's Victory
13. Battle of the Thames.

Naval Battles.

13. The ***Hornet*** and the ***Peacock***.
13. The ***Chesapeake*** and the ***Shannon***.
13. The ***Argus*** and the ***Pelican***.
13. The ***Enterprise*** and the ***Boxer***.
14. The Creek War ended at Horse Shoe Bend.
14. Battle of Lundy's Lane.
14. Washington captured and burned.
14. Battle of Plattsburg.
14. Hartford Convention.
14. Treaty of Ghent.
15. Battle of New Orleans.
16. Indiana admitted.

817 **JAMES MONROE**, President.
Daniel Tompkins, Vice-President.
17. Mississippi admitted.
18. The Seminole War.
18. Capture of Pensacola.
18. Illinois admitted.
19. Alabama admitted.
19. Florida purchased of Spain.
20. Maine admitted.
20. The Missouri Compromise.

MONROE re-elected President.
Daniel Tompkins, Vice-President.
21. Missouri admitted.
24. Visit of Lafayette.

George III.

French Revolution.

93. ***Reign of Terror.***

99. Overthrow of the Directory.
99. **Napoleon Bonaparte** first Consul.

4. Napoleon Emperor.
4. Irish Rebellion.

5. Battle of Austerlitz.
6. Battle of Jena.
8. Peninsular War.

9. Battle of Wagram.

14. Battle of Waterloo.

Napoleon banished.

15. Treaty of Paris.

George IV.

21. Death of Napoleon.
Charles X.

CHART IX.

			Frederick William III.
1825	**JOHN QUINCY ADAMS**, President. **John C. Calhoun**, Vice-President. 25. Controversy concerning removal of Creek Indians.	26. John Adams died. 26. Thomas Jefferson died.	
1829	**ANDREW JACKSON**, President. **John C. Calhoun**, Vice-President. 32. Black Hawk War. 32. Excitement concerning tariff legislation.	32. Nullification in South Carolina. 32. The President vetoes the bill to re-charter the United States Bank.	30. Louis Phillipe. 30. Revolution in Poland. 32. Parliamentary Reform.
	JACKSON, re-elected President. **John C. Calhoun**, Vice-President. 33. Removal of public funds from the Bank of the United States.	35. Seminole War. 36. Arkansas admitted.	
1837	**MARTIN VAN BUREN**, President. **Richard M. Johnson**, Vice-Pres't. 37. Great financial revulsion.	Continuation of Seminole War. 37. Battle of Okachonee. 37. Michigan admitted.	37. **Victoria.** 40. Frederick William IV.
1841	**WILLIAM H. HARRISON**, Presid't. **John Tyler**, Vice-President. President Harrison died April 4th, 1841. **TYLER**, President.	41. The Northwestern boundary fixed by treaty 41. Sub-Treasury bill repealed. 41. President vetoes the United States Bank. 43. The "Dorr Rebellion" in Rhode-Island.	
1845	**JAMES K. POLK**, President. **George M. Dallas**, Vice-President. 45. Florida admitted. 45. Texas annexed. 46. Iowa admitted. 46. General Taylor sent to the Rio Grande. 46. ***War with Mexico*** declared. 46. Battle of Palo Alto. 46. Battle of Resaca de la Palma. 46. Matamoras captured. 46. Monterey captured.	47. Battle of Buena Vista. 47. Capture of Vera Cruz. 47. Battle of Cerro Gordo. 47. Battle of Contreras. 47. Capture of Molino del Rey. 47. Capture of Chepultapec. 47. Fall of Mexico. 48. Treaty of Peace. 48. Gold discovered in California. 48. Wisconsin admitted.	48. Revolution in Hungary. 48. Republic proclaimed in France. Louis Napoleon Bonaparte, elected President
1849	**ZACHARY TAYLOR**, President. **Millard Fillmore**, Vice-President. 49. Territory of ***New Mexico*** organized. 50. Taylor died July 9. **FILLMORE**, President. 50. ***California*** admitted into the Union.	50. Territory of ***Utah*** organized. 50. ***Population of U. S. 23,191,876.*** 51. Fugitive Slave Law enacted. 52. Henry Clay died, aged 75. 55. Daniel Webster died, aged 70.	
1853	**FRANKLIN PIERCE**, President. **W. R. King**, Vice-President. 53. The ***Gadsden Purchase.***	52. Kansas-Nebraska Bill passed. 54. Kansas struggle begun. 54. Perry's treaty with Japan.	52. **Louis Napoleon**, Emperor. 54. Crimean War.
1857	**JAMES BUCHANAN**, President. **John C. Breckenridge**, Vice-Pres't. 57. Mormon insurrection. 57. Continued violence in Kansas. 57. General monetary panic.	58. ***Minneota*** admitted into the Union. 59. ***Oregon*** admitted into the Union. 59. John Brown's raid. 60. South Carolina secedes from the Union. 60. ***Population of U. S. 31,443,231.***	

CHART X.

1861 **ABRAHAM LINCOLN**, President.
Hannibal Hamlin, Vice-President.

61. Mississippi, Alabama, Florida, Georgia, Louisiana and Texas secede.
61. Kansas Admitted.
61. Southern Confederacy formed.
61. Attack on Sumter.
61. Virginia, Tennessee, North Carolina and Arkansas secede and join the Confederacy.
61. Seizure of Harper's Ferry and Norfolk.
61. Battle of Phillippi.
61. Union repulse at Big Bethel.
61. Battle of Bull Run.
61. Battle of Wilson's Creek.
61. Battle of Ball's Bluff.
61. Battle of Belmont.
62. Battle of Mill Spring.
62. Capture of Fort Donelson.
62. The Monitor and the Merrimac.
62. Battle of Pea Ridge.
62. Battle of Shiloh.
62. Capture of New Orleans.
62. McClellan's seven days battles.
62. Battle of Richmond, Ky.
62. Second Battle of Bull Run.
62. Battle of Corinth.
62. Battle of Antietam.
62. Battle of Fredericksburg.
62. Battle of Stone River.
63. The ***Emancipation Proclamation.***
63. Battle of Chancellorsville.
63. Battle of Gettysburg.
63. Surrender of Vicksburg.
63. Draft riots in New York.
63. Battle of Chicamauga.
63. Battles of Lookout Mountain and Missionary Ridge.
63. ***West Virginia*** admitted.
64. Wilderness Battles.
64. Battle of Spottsylvania.
64. Battle of Cold Harbor.
64. Petersburg beseiged.
64. Battle of Resaca.
64. Battle of Kenesaw.
64. Battle of Atlanta.
64. Battle of Mobile Bay.
64. Battle of Winchester.
64. Battle of Fisher's Hill.
64. Battle of Cedar Creek.
64. ***Nevada*** admitted.
64. Sherman's March to the Sea.
64. Sinking of the Alabama.
65. Capture of Fort Fisher.

6a. Prince Albert died.

1865 **LINCOLN**, re-elected President.
Andrew Johnson, Vice-President.

65. Battle of Bentonsville.
65. Battle of Five Forks.
65. Capture of Petersburg.
65. Fall of Richmond.
65. ***Surrender of Lee.***
65. Surrender of Johnston.
65. ***Lincoln Assassinated,*** April 14.

ANDREW JOHNSON, President.

66. The Atlantic Cable laid.
66. Tennessee re-admitted.
67. ***Nebraska*** admitted.
67. Purchase of Alaska.
67. Fourteenth Amendment adopted.
67. Amnesty proclamation.
68. Impeachment of President Johnson.

65. Fenian insurrection in Ireland.
67. Austro-Prussian War.
68. North German Confederation formed.

1869 **ULYSSES S. GRANT**, President.
Schuyler Colfax, Vice-President.

69. Pacific Railroad completed.
70. Fifteenth Amendment adopted.
70. ***Population of U. S. 38,558,371.***
71. Chicago Burned.
72. Settlement of the ***Alabama Claims.***
72. Settlement of the ***Northwestern Boundary.***
72. William H. Seward died, aged 71.
72. Horace Greeley died, aged 61.

71. Franco-Prussian War.
71. Battle of Sedan.
Napoleon III. overthrown
72. King William proclaimed Emperor.
Rise of French Republic
Thiers, President.

1873 **GRANT**, re-elected President.
Henry Wilson, Vice-President.

73. The Modoc War.
73. Great financial panic.
76. The Custer Massacre.
76. ***Colorado*** admitted.
76. The ***Centennial Exhibition.***

1877 **RUTHERFORD B. HAYES**, Pres't.
William A. Wheeler, Vice-Pres't.

77. The Nez Perce War.
77. The remonetization of Silver.
79. Resumption of Specie Payments.
80. ***Population of U. S. 50,182,595.***

77. Russo-Turkish War.
Fall of Turkish power in Europe.

1881 **JAMES A. GARFIELD**, President.
Chester A. Arthur, Vice-President.

81. President Garfield shot, July 2, by Charles J. Guiteau.
81. His death, Sept. 19.

CHESTER A. ARTHUR, President.

82. Trial and sentence of Guiteau.

81. Alexander II. of Russia assassinated.

CHART XI.

1885

GROVER CLEVELAND, President.
Thomas A. Hendricks, Vice-Pres't.

85. General U. S. Grant died, July 23.
85. General Geo. B. McClellan, died Oct. 29.

Public Debt.

85. $1,863,964,873 14.
86. 1,775,063,013 78.
87. 1,657,602,592 63.
88. 1,692,858,984 58.

85. Gen. Winfield S. Hancock died, Feb. 12.
85. Vice-President Hendricks died, Nov. 23.
86. Haymarket riot, Chicago.
86. Gen. John A. Logan died, Dec. 26.

National Expenditures.

85. $260,226 935.
86. 242,483,138.
87. 267,932,180
88. 267,924,801.

88. General Sheridan died, Aug. 5.

88. William I., Germany died Mch. 9.
Frederick III. of Germany, died June 15.
William II. Emperor.

1889

BENJAMIN HARRISON, President.
Levi P. Morton, Vice-President.

89. Washington admitted.
89. Montana admitted.
90. Wyoming admitted.
90. Idaho admitted.

Public Debt.

89. $1,619,052,922 23.
90. 1,552,140,204 73.
91. 1,545,996,591 61.
92. 1,558,464,144 63.

90. Pop. of United States, 62,622,250.
Pan-American Congress.
Behring Sea Arbitration.
Dispute with Chili.
Dispute with Italy.
91. General Sherman died, Feb. 15.

National Expenditures.

89. $229,288,978.
90. 318,040,711.
92. 365,773,905.
92. 345,023,330.

1893

GROVER CLEVELAND, President.
Adlai E. Stevenson, Vice-President.

93. Wilson tariff measure.
93. Commercial and Monetary panic.

Public Debt.

93. $1,545,985,686 13.
94. 1,632,253,636 68.
95. 1,675,120,983 25.
96. 1,769,840,323 40.

93. World's Columbian Exposition at Chicago.
94. Railroad riots at Chicago.
96. Venezuelan imbroglio.

National Expenditures.

93. $383,447,954.
94. 365,195,298.
95. 356,195,296.
96. 352,179,448.

94. President Carnot of France assassinated.

1897

WILLIAM McKINLEY, President.
Garrett A. Hobart, Vice-President.

98. Hawaii annexed.
98. Battle-ship Maine destroyed at Havana, Feb. 15.
War with Spain declared, Apr. 25.
Naval Victory, Manila Bay, May 1.
Battle of Guasimas, June 24.
Battle of San Juan and El Caney, July 1.

Public Debt.

97. $1,817,672,665 90.
98. 1,796,531,995 90.
99. 1,991,927,306 32.

98. Naval Victory at Santiago, July 3.
Surrender of Spanish Army, Santiago.
Manila surrendered.
Peace Protocol signed, Aug. 12.
Treaty of Peace signed at Paris, Dec. 10.
Porto Rico, the Phillipines and Guam ceded to the U. S.
Filipino revolt.
1900. Galveston destroyed by hurricane.

National Expenditures.

97. $365,774,159.
98. 443,368,582.
99. 605,072,179.

97. War between Turkey and Greece.
Famine in India.

King Humbert of Italy assassinated, July 29, 1900.
1900. Boxer rising in China.
Partition of Samoa.
Boer War.

1901

WILLIAM McKINLEY, President.
Theodore Roosevelt, Vice-President.

Pan-American Exposition at Buffalo.
President McKinley shot by Leon F. Czolgoscz at Buffalo Sept. 6, and died Sept. 14.

THEODORE ROOSEVELT, Pres't.

Civil Government in the Phillipines, inaugurated July 4.

Queen Victoria died Jan. 22, 1901.
Edward VII. King.

1619, was the cause of the differences between the northern and southern states, which resulted in the withdrawal, in 1861, of eleven states from the Union and the formation of the southern Confederacy, called the Confederate States of America. This brought on the Civil war of 1861–65, in which 2,780,000 Union troops and 690,000 Confederate soldiers contended. It cost the lives of 500,000 men, left the southern states almost ruined, and encumbered the nation with a debt of $2,800,000,000. The first gun was fired at Fort Sumter, April 12, 1861, and the surrender of Lee, which closed the war, took place at Appomattox Court House, Va., April 9, 1865. The proclamation of freedom to the slaves was issued Jan. 1, 1863, and in 1870 the fifteenth amendment to the constitution was passed, which provides that "the right of citizens of the United States to vote shall not be denied or abridged by the United States on account of race, color, or previous condition of servitude." The debt has been reduced nearly one-half, in spite of the enormous amount paid out every year in pensions to the survivors of the war. The south has entered upon a new era of prosperity, with the development of its mineral resources, the increased production of cotton and tropical fruits, and the promotion of other industries by the introduction of northern capital. The city of Washington, in the District of Columbia, is the capital of the United States. On the 16th of February, 1898, the nation, which had long been in sympathy with the struggles of Cuba for freedom from the oppression of Spanish rule, was roused to action by the explosion of the battleship *Maine*, probably through treachery, in the harbor of Havana. War with Spain followed, lasting from April 20, 1898 to April 11, 1899, and resulting in the independence of Cuba, and the cession of Porto Rico and the Philippine islands to the United States. See SPANISH-AMERICAN WAR, SLAVERY, CONFEDERATE STATES, STAMP ACT, etc. See histories of the United States by Von Holst, Bancroft, MacMaster, Higginson, etc.

Uni'ted States, Depart'ments of. There are eight departments of the executive branch of the government of the United States, of which the President is the head. The heads of the departments, known as secretaries, are appointed by the President, subject to confirmation by the senate. They have a salary of $8,000 a year, have no seats in congress, and form the President's cabinet or board of advisers. The heads of the departments are the secretary of state, secretary of the treasury, secretary of war, secretary of the navy, secretary of the interior, secretary of agriculture, postmaster-general, and attorney-general. The department of state, called the department of foreign affairs when it was formed in 1789, has charge of all the relations and business of the United States with foreign nations. The divisions, or bureaus as they are called, are the diplomatic bureau, consular bureau, bureaus of statistics, accounts, etc. There are three classes of ministers sent to foreign countries to represent the United States: ministers plenipotentiary, of which there are thirteen, ministers resident, and "chargés d'affaires" (persons in charge of affairs). In the principal foreign cities, consuls or government agents are stationed, who look after the interests of Americans, residents or travelers, and especially American seamen.

The principal officers of the state department, besides the secretary, are three assistant secretaries, seven heads of bureaus, one solicitor, and one chief clerk.

The largest and most important department is that of the treasury, which was formed in 1789. The secretary of the treasury has to superintend the collection of revenue, to grant warrants for money used in carrying out the appropriations of congress, to oversee the public debt, national banks, and coinage, internal revenue, etc. There are three assistant secretaries, eight division chiefs, two comptrollers, and six auditors. There is also a treasurer of the United States, who has charge of all public money, and pays it out only on orders from the secretary of the treasury; a register of the treasury, who keeps the accounts; commissioner of internal revenue; director of the mint; chiefs of the bureaus of engraving, statistics, and navigation; inspectors of the marine hospital, life-saving service, and steamboats; superintendent of the coast survey; and the supervising architect. The director of the mint holds his place for five years, and has charge of the mints and assay offices. The chief of the bureau of engraving has the oversight of the printing and engraving of all United States bonds, bank notes, etc. The internal revenue bureau has charge of the collecting of government taxes; the coast survey, of preparing maps and charts of the islands, capes, harbors, etc., of the coasts of the country; the life-saving service, of the appliances for the saving of life and property on the sea or lake coasts; the steamboat inspectors, of all boats used on the rivers, lakes, and oceans; and the architect, of all buildings, repairs, construction, etc. Full reports are required of all the officers of the treasury.

The President is commander-in-chief of the army, but never acts in that capacity, and makes all communications to it through the secretary of war. The army is directly under the commanding general, known as the lieutenant-general, and there are 20 general officers. (See ARMY.) The war department, through its secretary, reports on the state of the army, the necessary expenses, etc., and also has charge of the improvements of rivers and harbors. The adjutant-general, with the charge of the recruiting and mustering of soldiers, and records of the army; inspector-general, who examines arms and equipments

and the drill and discipline of the army; the judge-advocate-general in charge of the bureau of military justice; the signal officer, in charge of the signal service, which oversees the seacoast service; the quartermaster-general, with the duty of providing the army supplies; the commissary-general, who sees to the rations or food of the army; the paymaster, who keeps accounts, and the surgeon-general, are important officers of the department. There is also an ordnance department, an engineer corps, the chief of ordnance and the chief of engineers being very prominent and important officers. There is also a record and pension officer. See PENSIONS.

The navy has one admiral and eighteen rear-admirals. The navy department was not formed until 1798, and has eight bureaus of yards and docks, navigation, ordnance, construction and repairs, equipment and recruiting, provisions and clothing, steam engineering, medicine and surgery. The duties of the heads of these departments, who rank as commodores, are similar to those of the war department, and are sufficiently indicated by the name of the bureau. The post office department, permanently established in 1794, has, besides the postmaster-general, four assistant postmasters, each with a corps of superintendents and assistants. The first assistant postmaster has charge of the money-order system and the dead-letter office, where all unclaimed mail matter is sent, the free delivery system, and the location of new offices. The second assistant arranges the mail service, making contracts, furnishing bags, locks, etc. The third assistant postmaster has charge of the making and distributing of postage stamps, postal cards, wrappers, the collection of revenue from post offices and other financial operations. The fourth assistant postmaster has charge of post office inspectors, receives applications for postmasters, and issues their commissions, investigates losses by mail, etc. There are nearly 50,000 postmasters and 60,000 clerks in the United States under the post office department.

The department of the interior was formed in 1849 and has charge of public lands, Indians, pensions, patents, education, the census, and geological survey. There are two assistant secretaries; a commissioner of public lands; a commissioner of pensions, with the oversight of seventeen pension agencies, which, in the year 1900, paid an aggregate of $140,877,316 to about one million pensioners; the commissioner of Indian affairs, with a board of ten commissioners and seventy agents, who look after the interests of 262,965 Indians; the commissioner of patents, of education, of railroads, of fish and fisheries, and of the census and publication bureaus.

The agricultural department is the latest formed, dating only from 1889, and having charge of experimental stations where new plants are tested, of the distribution of rare seeds and plants, the collection of statistics, the study of animal diseases and insect pests, weather observations, etc.

The attorney-general presides over the department of justice, as it is called, and has four assistant attorney-generals and a solicitor-general, with the charge of the law business of the country, such as conducting suits for the United States, overseeing the United States attorneys, United States marshals, etc. It is distinct from the supreme court, which is the law-making body of the country.

Univer'sity, a higher educational institution, having the right to give degrees in several departments of learning, and with a body of teachers or faculty in each of the different schools or colleges connected with it. The word *universitas*, meaning a collection of persons or things, was first used to indicate any society, whatever its object, as the universities of priests, musicians, bakers, etc., in Rome. The schools of Plato and Isocrates at Athens and the museum at Alexandria resembled the later universities in their organization and objects. The modern university, dating back to the 12th or 13th century, is thought to be the outgrowth of the schools connected with the convents and monasteries throughout Europe. When some popular teacher, such as Abelard or Peter Lombard, drew crowds of students, these usually formed themselves into a corporation to which was given the name *universitas*. Some of the early universities, as that of Paris, were formed by a body of teachers, while again, as at Bologna, they were corporations of students. The faculties of a university are the teachers in particular departments, as the faculty of law, faculty of arts, etc. The two highest officers of a university have usually been the rector and chancellor. A degree is given by the university when a student has passed through a certain part of the course of study. The degree of doctor or master at first entitled the person who received it to teach in the university giving the degree. Pope Nicholas I., near the end of the 13th century, granted the University of Paris the right to endow its graduates with the power to teach anywhere. The degree of "bachelor," borrowed from the terms used in knighthood and indicating an imperfect or partial graduate, that is, one who had finished only the lowest stage of university work, was first introduced at the University of Paris in the 13th century. The colleges, as the different schools connected with a university are called, were at first mere boarding halls, which later were appropriated to the faculties of different departments.

Europe has about 100 universities, the oldest being the University of Paris, which was organized in the 12th century, but was not called a university until the 13th century. It had two chancellors, and gave degrees,

those of doctor and master at first being the same, but afterward the degree of master was given to those who were qualified to teach the arts, and that of doctor to those who could teach theology, law, or medicine. The Sorbonne was the theological school of this university, which was suppressed by the convention in 1793, but was revived by Napoleon I. as the University of France, which has charge of all public instruction. The "Academy" of Paris has five faculties, those of law, medicine, theology, science, and letters. It usually has 8,000 students. The University of Bologna, with its charter given by Frederick Barbarossa in 1158, was especially celebrated for its law schools and that of Salerno, of the 12th century, for its instruction in medicine. Women were admitted to both these schools, and graduates of Salerno practiced as "lady physicians" in the 12th and 13th centuries. Italy has now twenty-one universities; Germany, twenty-one; England, six; Ireland, two; Scotland, four; and there are about thirty in all the other countries of Europe. The oldest universities in Germany are at Heidelberg, Leipsic, Tübingen, Jena, and Halle. The German universities are governed by the professors, presided over by a rector, or chancellor. There are three grades of professors, called ordinary professors, extraordinary professors, and "privat-docents." The ordinary professors are the highest class, and are elected by government from candidates chosen by the faculty, and give lectures on the subject which they are selected to teach. The extraordinary professors have smaller salaries, and can lecture on any subject they please, as may also the privat-docent. The student attends any lectures he chooses, but cannot practice any profession without a certain course of university study. Göttingen university, founded in 1734, by Baron Munchausen, under the auspices of George II., king of England and elector of Hanover, was one of the most famous in Europe, having over 3,000 students, until that at Berlin was founded in 1810. The University of Tübingen, dating back to 1478, with seven faculties, is noted as the seat of what is called the Tübingen school of theology founded by Baur. The universities of Berlin and Bonn are among the most prominent in Germany, that at Berlin having about 5,000 students and 414 professors. Heidelberg university has a professorship of English literature, established in 1873, the first of the kind in Germany. The German universities are under the control of the government, and most of them are dependent upon state appropriations. The universities of Switzerland, Holland, Belgium, Russia, and Austria are on the German model. That of Prague, founded in 1348, is the oldest in central Europe. Louvain, founded in 1425, was once very famous, as was also the University of Leyden, founded by William of Orange. Spain has nine universities, and Portugal one. The University of Salamanca, established in 1415, had at one time 10,000 students, and 28 colleges. The oldest Scandinavian university is at Upsal, in Sweden, and there is one at Christiana, in Norway, and another at Copenhagen, in Denmark.

Of the four English universities, Oxford and Cambridge are the oldest, dating back to the 13th century. Those of Durham and London are modern, being founded in the 19th century. The University of London has no colleges directly connected with it, but confers degrees upon examination to students of nearly all the institutions of learning in the country. Oxford has twenty-three colleges and Cambridge eighteen colleges. This college system distinguishes the universities of England from those of the continent. A student must connect himself with a college before he becomes a member of the university. The teaching in these colleges is done almost entirely by tutors, and the professors of the university only deliver lectures on special subjects once or twice a week. Degrees are dependent upon examinations, and fellowships are provided, by means of which promising students can continue their advance studies for years. The Scottish universities are at Edinburgh, Glasgow, Aberdeen, and St. Andrews, that of St. Andrews being the oldest. They were patterned more after the German universities than those of England. The students were divided into four nations, named from the parts of Scotland from which they came. The University of Edinburgh has but one college, but that has all the powers of a university. The University of Dublin has only one college, Trinity college, but several faculties, including those of oriental and modern languages, mining, and civil engineering. Queen's university has three colleges, at Belfast, Cork, and Galway, each called Queen's college, and the governing body of the university holds its meetings at Dublin.

In the United States, the term university is loosely applied to many institutions which are strictly only colleges, just as the term college includes many academies and high schools. In its strictest sense, it is limited to institutions having several schools, as those of law, theology, arts, etc., in addition to the regular college course, where graduate work is carried on, that is, work done in the higher branches after graduation in a college. Harvard university, the oldest college in the country, is now one of the best equipped universities. It includes Harvard college, the Divinity school, the Law school, Lawrence Scientific school, Dental school (at Boston), the school of Agriculture, school of Veterinary Medicine, and the graduate department. It has 411 instructors and about 4,000 students. There is also an institution for the instruction of women by the Harvard professors, called the Harvard annex. The Agassiz museum and the Peabody museum hold its well-known collections.

The finest building is Memorial hall, built in honor of the alumni who fell in the Civil war. It is situated at Cambridge, near Boston.

Yale university, known as Yale college until 1887, is at New Haven, Conn., and takes rank with Harvard as one of the best institutions in the country. It was founded in 1701, and has recently celebrated its bicentennial. It includes, besides the college or academical course, schools of law, theology, medicine, philosophy, and arts. The school of fine arts, with its gallery of Italian pictures, and the Trumbull collection of fifty-four pictures, the Peabody museum, the Sheffield Scientific school buildings, Marquand chapel, Osborn hall, Vanderbilt hall, the Bicentennial buildings of 1901, and the library are among the noticeable structures. There are 270 instructors and about 2,500 students. Johns Hopkins university, founded in 1876, at Baltimore, Md., resembles the German universities in its methods. The work is largely graduate work, and the teaching is mainly by lectures. It was endowed by Johns Hopkins with a fund of $3,500,000. Higher mathematics and history are among the subjects in which special work is done. Clark university, at Worcester, Mass., founded in 1888, is an institution for graduate work only.

The state institutions are all called universities, but in only a few cases is the university system fully developed. The University of Michigan, at Ann Arbor, is one of the largest, ranking next to Harvard in the number of students. It has departments of law and medicine. Chicago university, with an endowment of $6,000,000, though a new institution, opening in 1892, already ranks among the great universities of the country. Its courses are so arranged that students can be admitted at any time, as there is instruction during the whole year. It has 209 instructors, selected from the best institutions in America and in Europe, and about 2,500 students. Many institutions of learning bearing the name of university in the United States are founded and carried on by the different religious denominations, such as the Wesleyan universities at Delaware, O., and at Middletown, Conn., De Pauw university at Green Castle, Ind., all under the direction of the Methodists; while Brown university at Providence, R. I., belongs to the Baptist denomination, as also the University of Rochester, and Dennison university. Most of the universities, both of Europe and of the United States, are mentioned under the name of the place where they are situated, but a full account of the numerous institutions called universities has not been attempted. See COLLEGES, OXFORD, CAMBRIDGE, ETC.

Univer'sity of Chicago, located at Chicago, was incorporated in 1890. It was founded by John D. Rockefeller, who contributed an aggregate of $10,000,000 for its establishment and endowment. About $3,000,000 additional has been donated by Marshall Field, S. A. Kent, Martin A. Ryerson, Miss Helen Culver, Mrs. Emmons Blaine, and others of Chicago. Mr. Charles Yerkes contributed $300,000 for the erection of the observatory at Lake Geneva, Wis., and for placing in it the largest telescope in the world. The buildings and grounds occupy a tract of land fronting on Midway Plaisance, between Washington and Jackson parks. The university opened its doors to students on Oct. 1, 1892. The university is organized into five divisions: the schools, colleges, and academies; the university extension; the university libraries, laboratories, and museums; the university press; and the university affiliations. The schools are those departments in which graduate work is done, and include schools of divinity, education, law, medicine, engineering, technology, fine arts, and music. There are colleges of liberal arts, literature, science, commerce and administration, and university college. The university extension division directs the work done by students who are unable to attend the daily exercises at the university. There are 291 instructors in the university, and the students in attendance number 3,520.

Univer'sity of Colorado, a state institution, is located at Boulder, and was first opened in 1877. Its organization comprises a college of liberal arts, school of applied science, school of medicine, school of law, college of dental surgery, and school of music. It also provides graduate courses. It is open to students of both sexes. The faculty numbers 80, and the number of students in attendance is 789, including the preparatory school.

Univer'sity of Illinois, located at Champaign, Ill., was founded by the state of Illinois, upon the donation by the national government of scrip for 480,000 acres of land. On account of this grant the state pays the university interest at the rate of five per cent. on about $495,000. The university was incorporated in 1867, as the Illinois Industrial university, and was opened to students in 1868. In 1885, the legislature changed the name of the institution to the University of Illinois. It includes the following schools: college of literature and arts, college of engineering, college of science, college of agriculture, graduate school, school of library science, school of music, college of law, college of medicine, school of pharmacy. The present value of the entire property and assets of the university is estimated at $1,600,000. It has nearly 200 instructors, and the number of students in attendance in 1901 was 2,044.

Univer'sity of Kansas, located at Lawrence, was established by act of legislature in 1864,

and is an integral part of the public school system of the state. The university embraces a graduate school, school of arts, schools of engineering, law, fine arts, medicine, and pharmacy. The faculty numbers 70, and the students in attendance 1,150.

Univer'sity of Minnesota, located at Minneapolis, is a state institution and was first organized in 1851, but dates its actual beginning from its reorganization in 1868. The university comprises the graduate department, college of science, literature, and the arts, college of engineering and the mechanic arts, school of mines, college of agriculture, college of law, department of medicine. It also has charge of the experiment station and geological and natural history survey. Students of both sexes are admitted, and the total enrollment, exclusive of summer schools, is 2,847. The faculty and instructors number 243.

Univer'sity of Missouri was established at Columbia in 1840, where academic work was begun in 1841. A normal department was organized in 1867. A college of agriculture was added in 1870, and also a school of mines and metallurgy, which is located at Rolla. Departments of law, medicine, and engineering have since been organized, and also a graduate department, which was opened in 1896. The faculty numbers sixty-five, with over 1,200 students enrolled.

Univer'sity of Nebraska, located at Lincoln, the capital of the state, is a part of the public school system of the state. It was founded by act of legislature in 1869, and is supported chiefly by a state tax, together with income from land sales and leases under act of congress of 1862, the annual revenue being about $270,000. It comprises the following colleges and schools: graduate school, colleges of literature, science, and arts, industrial college, college of law, school of fine arts, affiliated school of music. The faculty numbers 105, with 1,750 students in attendance, exclusive of the summer and preparatory schools. E. Benjamin Andrews, LL.D., is chancellor.

Univer'sity of Notre Dame, located two miles from South Bend, Ind., was founded by the Very Rev. Edward Sorin in 1842. It provides courses in the departments of arts and letters, science, architecture, civil, mechanical, and electric engineering, law, and pharmacy. The faculty number 56, and the students about 800.

Univer'sity of Oregon, is located at Eugene, 125 miles south of Portland. It is a part of the public school system of the state. The organization comprises colleges of literature, arts, science, and engineering, and schools of mines and mining, medicine, law, and music. It has 83 instructors, and 320 students.

Univer'sity of Pennsylvania, located at Philadelphia, is a state institution, the governor of the state being *ex officio* president of the institution. It grew out of an academy which was established in 1751, and was chartered under its present name in 1791. The university comprehends the college, including the school of arts and the Towne scientific school, the departments of philosophy (graduate school), law, medicine, dentistry, veterinary medicine, physical education, and astronomical observatory. It ranks among the older and better equipped institutions of the country. The instructors number 265, and the students 2,573.

Univer'sity of Vermont and State Agricultural college, located at Burlington. It has a faculty of 45, and 450 students.

Univer'sity of Wisconsin. See WISCONSIN.

U'pas, a tree belonging to the mulberry family, found in Java. It grows over 100 feet high, with a straight trunk and oval leaves covered with down, and a purple fruit, something like a small, rather long plum. It was long called the "deadly upas," and believed to be very poisonous, so that all animals going near it were killed, and even other trees and plants—travelers finding it growing solitary in a barren waste, with the bones of its victims around it. But instead it is found growing in the forests, and animals do not seem to avoid it. Many specimens have been collected without injury, and the tree is now in the principal botanical gardens of Europe. Its poison is similar in its effects to the poison ivy, and is found in the juice of the tree, and used by the natives on the points of their arrows. They also make a cloth from the inner bark of the tree, which, if it gets wet, produces a disagreeable itching. Bags are made from the tough bark of one species of upas.

Upsal' or **Upsala** (*up-sä'lä*), a city in Sweden, on the Sala river, forty miles northeast of Stockholm. It is situated in a fertile plain with fine buildings and parks. The cathedral, begun in the 13th century, is the most celebrated in Sweden. The university, founded in 1474 and richly endowed by Gustavus Adolphus, has fine buildings, over 70 instructors, and 1,386 students. There are also connected with it a botanic garden, a mineralogical collection, a museum, and an observatory.

U'ral, a river of Russia, separating Europe from Asia. It rises in the Ural mountains, flowing south and southeast for 1,100 miles, and emptying into the Caspian sea. There is very little navigation. Its banks have been fortified by a line of forts, and its fisheries are very valuable.

U'ral Mountains form a part of the boundary between Europe and Asia, separating European Russia from Siberia. The chain is made up of a series of parallel ridges in the southern part, running toward the northwest, the highest summit being 4,680 feet. Farther north there are several low ridges, with peaks reaching 5,115 feet, while one low ridge in the extreme north completes the range. The middle part of the range is very rich in minerals, having mines of gold, copper, platinum, and iron; precious stones, such as the emerald, beryl, topaz, amethyst, and diamond, are also found. The population inhabiting the mountains and supported by the mines is 242,487.

U'ranus, in Grecian mythology, is sometimes the son, but generally the husband, of Gæa, the earth, by whom he became the father of Oceanus, Saturn, the Cyclops, and others. He hated all his children, and confined them in Tartarus; but Cronus, at the instance of his mother, overthrew and dethroned him.

U'ranus. See PLANETS.

Ur'ban, the name of eight popes, of whom the following deserve special mention:—

Ur'ban II., a Frenchman by birth and originally a monk of Cluny, was elected in a council held at Terracina in the year 1088. His name was Otho, and soon after his election he resumed possession of Rome, the fortresses of which had been held by the anti-pope Guibert, styled Clement III., whom he compelled to withdraw. A great council was held in Piancenza in 1095, in which the anti-pope and his adherents were excommunicated; and at the same council the crusade was proclaimed. Urban died in the year 1099, just at the time when the crusade which he had organized terminated in the occupation of Jerusalem.

Ur'ban V. (originally William de Grimoard) was the last of the popes who resided at Avignon, and the one by whom the papal seat was retransferred to Rome. He was elected pope on the death of Innocent VI. in 1362, and died in 1370, leaving behind him the reputation of great piety and zeal for religion and good morals.

Ur'ban VI., whose name was Bartolommeo Prignani, was the pope under whom the great western schism had its origin. On the death of Gregory XI., in 1378, Prignani was elected in a conclave held at Rome under circumstances of great excitement, owing to the apprehensions of the populace that a French pope would be elected and Rome again abandoned. Prignani was crowned under the title of Urban VI., but immediately afterward twelve French cardinals assembled at Anagni and revoked his election, declaring that they had voted for him under fear of violence. They were joined by three Italian cardinals, and then proceeded to elect the cardinal bishop of Cambray pope, under the title of Clement VII. Clement took up his residence at Avignon, but Urban remained at Rome, where he appointed a number of new cardinals, and excommunicated Clement and his adherents. The result was that Urban was recognized as lawful pope by one portion of the church and Clement by the other, each maintaining his claim by extreme measures. Urban was besieged by Charles, king of Naples, at Novara, whence he withdrew to Genoa, taking with him, as prisoners, the cardinals of his party with whom he had quarreled, several of whom he is said to have put to death. He died in 1389, from injuries sustained in a fall from his horse.

Ur'ban VIII., the successor of Gregory XV., whose family name was Maffeo Barberini, was born at Florence, in 1568, and, after many years of service in various capacities, was elected pope in September, 1623. His memory has suffered through the imputation of nepotism; but his pontificate was, on the whole, vigorous and enlightened. He was the founder of the celebrated College of the Propaganda, and to him Rome is indebted for many public works, including large and important additions to the Vatican library. His pontificate was also distinguished by the acquisition of the duchy of Urbino to the Holy See in the year 1626. He died in 1644, and was succeeded by Innocent X.

Urban'a, a town in Champaign county, Illinois, noted as the seat of the University of Illinois, a thoroughly equipped institution of learning, with a large corps of professors and instructors and about 2,000 students in its various departments. Population 5,728.

Urbino (*ŏr-bē'no*), in central Italy, is situated between the rivers Metauro and Foglia, twenty miles southwest of Pesaro. It has a magnificent palace, once the residence of the dukes of Urbino, where was the famous library of the Della Rovere family, afterward removed to the Vatican. Another handsome palace is that of the Albini, a family who gave a pope to the church, under the name of Clement XI. Urbino is the birthplace of Raphael, and became a part of the kingdom of Italy in 1860. Population 8,000.

U'rim and Thum'mim, a mysterious contrivance on the breastplate of the Jewish high priest, either consisting of the four rows of precious stones upon which the names of the twelve tribes were engraved, or of two images personifying — most probably — "Truth" and "Revelation." Others assert that the words personified by these images were "Light"

and "Perfection," and still others that they were "Doctrine" and "Judgment." The consulting of the Urim and Thummim as an oracle was a very solemn ceremony with the Jews, but it is never mentioned after Solomon's time.

Ur'sa Ma'jor. See BEAR, GREATER AND LESSER.

Ur'sa Mi'nor. See BEAR, GREATER AND LESSER.

Ur'sula, St., a female saint and martyr, especially honored in Germany and Cologne, the place of her reputed martyrdom, who is variously assigned to the third, the fourth, and the fifth centuries. According to the legend, she was the daughter of Deonatus, a British king, and on account of her beauty was sought in marriage by the son of a pagan prince. Fearing that she might bring ruin upon her father by a refusal, she consented to marry the prince, but made it a condition that she should be allowed three years, during which she proposed to make a pious pilgrimage in company with her ten maidens, each being accompanied by a thousand other maidens, making 11,000 in all. The maidens were accordingly collected from all parts of the world, and the expedition set sail from the British coast. Arriving at the mouth of the Rhine, they sailed up the river to Cologne, and thence to Basel, where, leaving their galleys, they proceeded by land to visit the tombs of the Apostles at Rome. This pilgrimage accomplished, they returned down the river to Cologne, which had meanwhile fallen into the hands of an army of Huns, under the leadership of a chief, who, although not named, is plainly the Attila of history. Landing at Cologne, in ignorant security, the pious virgins fell into the hands of these barbarians, by whom they were all seized and put to death. A host of angel warriors, however, interposed and smote the cruel Huns; and in gratitude to their martyred intercessors the citizens erected a church on the site now occupied by the Church of St. Ursula.

Ur'sulines, a religious order of females in the Roman Catholic church, taking their name from the saint and martyr who forms the subject of the above article. They take their origin from Angela Merici, who, early in the 16th century, formed at Brescia an association of young women who fully devoted themselves to the care of the sick, the instruction of children, and the relief of the poor. In the year 1565, a house was opened at Cremona and the order spread over several dioceses in Italy. Soon afterward it was established in France, where one of its members was the celebrated sister Madeline St. Beuve. It was in France that the sisters added to their vows the instruction of female children, which has since formed the most marked characteristic of their order.

Uruguay (*ör'ö-gwā*) is a small republic in South America, bounded on the north and northeast by Brazil, on the east and southeast by the Atlantic, on the south by the Rio de la Plata and the Atlantic ocean, and on the west by the Argentine Republic, from which it is separated by the Uruguay river. Its greatest length and greatest breadth are each a little over 300 miles, the total area being 72,210 square miles. The interior of Uruguay is very imperfectly known. In the south the country is a sort of terraced upland, with a treeless coast line possessing some excellent harborage, while the shores facing the Atlantic are low and sandy. The climate is mild; rain falls quite copiously in winter, but is very rare in summer. Agriculture, long in a backward state in spite of the natural richness of the soil, is said to have advanced recently; wheat, maize, tobacco, grapes, and olives being raised. The wealth of the country consists mainly in its pasturage, which supports large herds of cattle, horses, and sheep, the wool of Uruguayan sheep being of a superior quality. Primary education is obligatory. In 1898, there were 887 elementary public and private schools, with 1,959 teachers and 72,242 pupils. The capital, Montevideo, has a university and a national library of over 27,000 volumes. Its population numbers about 266,000. Uruguay was originally settled by Spanish colonists from Buenos Ayres on the other side of the La Plata; but the territory which forms the natural limit of Brazil on the south was claimed by Portugal, and a war ensued between the two nations for its possession, which terminated in favor of Spain. The independence of Uruguay was secured by treaty in the year 1828, but, like most South American republics, it has suffered incessantly from internal discords. Population 895,364.

U'ruguay, a river of South America, rises in southern Brazil, flows westward a little less than 100 miles, and then southward, forming a boundary line between the Argentine Republic on the west, and Brazil and Uruguay on the east, and unites with the Parana to form the La Plata in 34° S. latitude, its total length being about 1,000 miles. Its chief branch is the Rio Negro.

Urumiah (*ö-rö-mē'a*), a town of Persia, situated ten miles west of Lake Urumiah, in a wide and fertile plain, is surrounded with a mud wall, but has no gates. Extensive fruit and vegetable gardens are situated both within and without the walls. The houses of the richer classes are lofty and spacious, and many of those of the poor are adorned with flowers and vines. The city is the seat of a Nestorian bishop and of an American Presbyterian mission, which is in a very prosperous condition. The city is said to have been the birthplace of Zoroaster, founder of the religion of ancient Persia, and has a population of 25,000.

Urumi'ah, the principal lake of Persia, is about 4,000 feet above the level of the sea, and nowhere exceeds 20 or 25 feet in depth. It is about 80 miles in length, with an average width of about 25 miles. Its waters are largely impregnated with salt, and are so heavy as to be little ruffled by the strongest wind. No fish are found in it, although several rivers empty into the lake. Its average depth is only about 12 feet, and it is fast drying up, leaving a gradually widening beach of salty crust, which supplies the whole of Kurdestan with salt.

U'sury. This word originally meant anything charged by the lender of money for its use; but it now refers to any charge above the legal rate. In most, if not all, civilized nations there are laws limiting the rate which lenders of money may charge for its use, with greater or lesser penalties for all charges which go above this limit. In the United States, the laws of the states vary somewhat in this respect, although in all of them a legal rate is established for cases where there is no express contract — six per cent. in nearly all the states — and another limit prescribed — generally eight or ten per cent. — within which contracts may be made by the parties, and beyond which contracts are rendered void, or at least cannot be enforced by law.

U'tah, a state of the United States, bounded on the north by Idaho and Wyoming, on the east by Colorado, on the south by Arizona, and on the west by Nevada. Its greatest length from north to south is a little over 300 miles, and its greatest breadth from east to west is a little less than 300, the total area being about 84,000 square miles. Utah is an immense basin from 4,000 to 5,000 feet above the level of the sea, surrounded by mountains which at some points reach the height of 10,000 or 12,000 feet. This great valley, which includes the state of Nevada, is formed by a branch of the Rocky mountains on the east and the Sierra Nevada on the west. The surface is greatly diversified, containing high mountains, broad valleys of greater or lesser dimensions, and desert plateaus. Near the middle of the northern boundary the Wahsatch mountains enter the territory and extend southward, thus dividing the state into two parts. This is the principal mountain range of the state, and constitutes a sort of watershed from which the streams flow off eastward and westward, the eastward streams to the Colorado of the west and the westward ones to the Great Basin. The surface of the Great Basin presents an alternation of broad, desert valleys and narrow, abrupt mountain ranges rising sharply from the valleys. The lowest portion of the state, which is near the southern border, is less than 3,000 feet above the sea, but there are quite a number of high mountain peaks, among which may be mentioned Mt. Nebo, 11,680 feet in height, LaMotte, 12,892 feet, and Burro, 12,834 feet. Along the northern border of the state extends eastward and westward the Uintah mountain range. South of this range and east of the Wahsatch is a region of plateaus, horizontal or slightly inclined, and receding gradually from the high mountains. The Great Basin in the western part of the state consists of a number of small basins in which the waters from the surrounding mountains sink or collect in a lake, which rises or falls according to the extent of their supply and the extent of their evaporation. The largest of these is Great Salt lake, stretching along the base of the Wahsatch range. The only other bodies of water of considerable magnitude are Bear lake and Utah lake, both fresh, and tributary to Great Salt lake.

Because of the insufficient rainfall, irrigation is resorted to in agriculture, wheat yielding the best crop. The state is rich in minerals, gold, silver, coal, and copper being mined; and many kinds of stone are quarried. The chief manufacturing industry is flour and grist mill products.

In the elementary schools of the state there were, in 1898, 70,965 pupils enrolled with 1,385 teachers; in the high schools, 941 pupils and thirty-four teachers; while the four colleges numbered fifty-nine instructors and 172 students.

The state is well supplied with railroads, the Union Pacific and Central Pacific crossing it near the northern boundary. From Ogden, a branch of the Union Pacific runs northward to Montana and another southward to Salt Lake City, thence to the southern part of the state. In addition to these, there are numerous short branches in the mountains. Utah was settled by the Mormons under Brigham Young in 1847, and was organized as a territory in 1850. From the first organization of the territory there has been some conflict between the Mormon church and the United States government, chiefly on account of polygamy, the various laws passed by congress for the suppression of that institution being either boldly defied by the Mormons, or practically nullified by Mormon officials. The Edmunds bill of 1882 was perhaps the first really efficient legislation on the subject. This measure disfranchised all polygamists, and disqualified from service on juries all persons who accepted the doctrines of the Mormon church in reference to polygamy. Another bill passed by congress annulled all acts of the territorial legislature designed in any manner for the protection of polygamy, and contained many other radical provisions for the suppression of the institution. These measures of congress, together with the constant increase of the "Gentile" population throughout the territory, give good reason to hope that the day is not far distant when this blot upon American civilization will be entirely removed. Utah was admitted to the

Union Jan. 4, 1896. Population in 1900, 276,749; that of Salt Lake City, its capital, 53,531.

U'tahs or U'tes, a tribe of Indians formerly roaming over Utah, Colorado, and New Mexico, but now occupying reservations in Utah and Colorado. Their number is about 5,000.

U'tica, an ancient city of Africa, near the bay of Carthage, and a short distance from the city of Tunis. The Tyrians are said to have founded it 287 years before Carthage was built. It was an ally of Carthage in her early wars with Rome. But in the third Punic war, Utica made an early and separate submission to Rome, and, when Carthage fell, was rewarded with a part of her territory, and the Roman governor made his residence there. In the accounts of the struggles between Sulla and Marius and between Cæsar and Pompey, it is often referred to as an important city. It had an amphitheatre, which would seat 20,000 people, and an artificial lake on which mimic sea battles were fought. Its water supplies were stored in many immense cisterns, some of which remaining are 136 feet long, 19 feet wide, and 20 or 30 feet deep. Augustus made it a free city. The Vandals conquered it in 439, then the Byzantine emperors recovered and held it till the 8th century, when the Arabs conquered and destroyed it.

U'tica, a city of New York on the Mohawk river, about 85 miles from Albany and 45 miles from Syracuse. The city is regularly and handsomely built, and rises from the south bank of the river to an elevation of 150 feet. One of the lunatic asylums of the state is located here, together with a number of other benevolent and charitable institutions. The manufactures of the city amount to several millions annually, and comprise a great variety of products. The annual cost of maintaining the public schools is $168,231; the number of teachers employed is 231; and there are 8,875 pupils enrolled. At the period of the Revolutionary war, Utica was a frontier trading post, and was also the site of Fort Schuyler, built to guard a settlement against the French and Indians. Population 56,383.

Uto'pia is the name given by Sir Thomas More to the imaginary island which he makes the scene of his work, entitled *Utopia* (from the Greek meaning "nowhere"), first published in Latin in 1516, and translated into English by Bishop Burnet. This island, which More represents as having been discovered by a companion of Amerigo Vespucci, is the abode of a happy society, free from all the cares, anxieties, and miseries of mankind. In this community all property belonged to the government, no private ownership being allowed; and the wants of all persons were supplied from the common stock. More's work, which is still published, attained a great popularity, and the epithet Utopian is still applied to all plans for the improvement of society that are deemed visionary and impracticable. A counterpart to More's work is found in a production of the present day, entitled *Looking Backward*, by the late Edward Bellamy.

Utrecht (*u'trekt*), a city of the Netherlands, capital of the province of Utrecht, is beautifully situated in a district of rich, grassy meadows, extensive orchards, flower gardens, and cultivated fields. It is favorably situated for trade, being the point from which several railroads radiate, and having excellent water communication by way of the old Rhine and the Vecht. Utrecht is one of the oldest cities of the Netherlands, and was probably founded by the Romans. It was here that the union of the northern provinces for the defense of their political and religious freedom against the tyranny of Spain was formed, Jan. 23, 1579. Population, 102,040.

U'trecht, Treaty of. The above-named city is chiefly noted for the treaty or treaties of peace concluded in the year 1713 between France and the allied powers — England, Austria, etc. — after the ten years' war relating to the Spanish succession. See Macaulay's essay reviewing Lord Mahon's *History of the War of the Succession in Spain.*

V

Vaccination (*vak'sĭ-nā'shŭn*) is the process by which the disease termed *vaccinia* or cowpox, from the Latin word *vacca*, "a cow," is introduced into the human system to protect it against the attack of the more severe disease of smallpox. In his *Inquiry into the Causes and Effects of the Variolæ Vaccinæ*, Jenner, the discoverer of this remarkable remedy, establishes the following facts: (1) That this disease when communicated to man is a sure protection from smallpox; (2) that the cowpox alone, and not other eruptions affecting the cow, which might be confounded with it, has this power of protection; (3) that the cowpox may be communicated at will from the cow to man by the hand of the surgeon; and (4) that the cowpox once ingrafted on the human subject may be transferred from person to person, giving each one the same immunity from smallpox as was enjoyed by the person infected directly from the cow.

Vacuum (*vāk'ū-ŭm*), the region in a closed vessel from which the air has been largely removed. To completely remove all gases from a closed vessel is impossible. To obtain a complete vacuum appears therefore to be a hopeless task. With an ordinary air pump, in good working condition, one may produce a vacuum in which the pressure is not more than two or three millimeters of mercury. But by means of a mercury pump one may easily exhaust a vessel until its pressure is only one-millionth that of the atmosphere. If, however, elaborate precautions are taken with a Sprengel pump, a vacuum of only one hundred-millionth that of the atmosphere may be obtained. See AIR PUMP, and read Kimball's *Physical Properties of Gases* (Houghton, Mifflin & Co., 1890), chap. v.

Valen'cia, an ancient city and seaport of Spain, and formerly its capital, stands on the shores of the Mediterranean, 300 miles by rail from Madrid. The Huerta, thirty-five square miles in extent, which surrounds the city resembles an immense orchard, and is watered by an intricate network of pipes and rivulets laid down by the Moors 800 years ago, and answering its purpose down to the present day. There are numerous picture galleries in the city, in the chief of which only the productions of the great Valencian school are to be seen. There is a museum, a botanical garden, and a fine old cathedral. The university, with its library of 50,000 volumes, has 39 professors and 1,728 students. The customhouse, dating from 1758, is now the cigar factory, which employs more than 3,000 persons and produces 120,000 pounds of tobacco yearly. Valencia is connected with Madrid by rail and is a famous summer resort of the more prosperous classes. Population 204,768.

Valen'cia, a town of Venezuela, South America, in the province of Caracas, two miles east of Lake Valencia. The city is situated in an exceedingly fertile district, in which cattle and horses are raised in great numbers. Population 40,000.

Val'entine, Basil, a celebrated German alchemist of whom so little is known that it is even disputed whether he lived in the 12th or in the 13th century. It has been maintained that he was a monk of the order of St. Benedict in St. Peter's convent at Erfurth; but his name does not appear on the Erfurth list, nor on the general lists at Rome. His works were mostly written in the old Upper-Saxon dialect, and were not printed until 1602, after which many of them were published in the form of French translations.

Val'entine or **Valenti'nus,** presbyter and martyr, according to the Roman legend, was arrested and thrown into chains at the instance of the Emperor Claudius about the year 270 A. D. He was handed over to Calphurnius, who employed one Asterius to win him back to idolatry, but instead of this, Asterius was won over to the Christian faith on account of the healing of his blind daughter by Valentine. The saint was kept in prison for a long time, but was finally beheaded. The custom of sending valentines is the survival of a practice connected with the worship of Juno on or about Feb. 14, and its association with this saint is purely accidental.

Valentin'ian I., emperor of the Western Roman empire from 364 to 375 A. D. As a military officer under Julian and Jovian, he rose to a high position, and on the death of Jovian was chosen emperor by the officers of the army at Nicæa. Soon after this he named his brother Valeus as his colleague, and the two brothers divided the empire between them, Valentinian, as emperor of the West, taking Italy, Illyricum, Spain, Britain, Gaul, and Africa. During Valentinian's reign there were wars in Africa and Germany, and Rome also came into collision with peoples of whom we now hear for the first time — Burgundians, Saxons, and Alemanni. The emperor's headquarters were at Treves during the greater portion of his reign. His general administration was wise and able, and in many respects beneficent. Although hard and exacting in the collection of taxes from his people, the money was spent in defending and improving his dominions, and not in idle show or luxury. He died in a fit of apoplexy in the year 375, and was succeeded by his two sons, Gratian and Valentinian II.

Valentin'ian II., an infant four years of age, and his half-brother Gratian, a lad of seventeen, became joint emperors of the Western Roman empire in 375 A. D. They made Milan their residence, while the empire was at least nominally divided between them, Valentinian taking Italy and a part of Africa. Gratian died in the year 383, and four years later Maximus, who had commanded a Roman army in Britain, crossed the Alps into the valley of the Po, and threatened Milan. The emperor and his mother Justina fled to Theodosius, emperor of the East, and besought his assistance, and in accordance with their request Theodosius marched into Italy with an army, defeated Maximus, and again set Valentinian on the throne. He was assassinated in 392 A. D.

Valentin'ian III., grandson of Theodosius the Great, was declared emperor of the West in the year 425 A. D. His reign of thirty years was a period of great and terrible events, associated with the names of Attila, Genseric, and Ætius, "the last of the Romans." Valentinian's usual residence was at Ravenna; but he fled to Rome in the year 452 on the approach of Attila, who, after ravaging Italy, died in the following year. In 454, Ætius, who had won the great victory over Attila at Chalons in the year 451, and who alone could have saved Rome from the destruction which hung over her, was treacherously murdered by Valentinian; and the next year the crime was avenged by the murder of the emperor himself while he was viewing some games in the Campus Martius. With the death of Valentinian the family of Theodosius became extinct.

Valenti'nus was the most important Christian theologian before Origen. He sought to combine the results of Greek philosophy with the doctrines of the Gospel, and treated the manifestation of Jesus as the keystone in the structure of thought which Greek science had reared. He may be regarded as superior to Philo in many respects, and as having surpassed Origen in delicacy of perception and vigor of style, although he was far behind him in the extent of his learning. He came to Rome from Egypt about 138 A. D., and died about 160.

Valet'ta, an important fortress and beautiful city, capital of the island of Malta. The city was founded by John Parisot de la Valette, who so gallantly defended the island of Malta against the Turkish fleet in 1565. Alone and unsupported by any of the Christian powers, La Valette held the island under circumstances of great difficulty and distress; and at the end of four months the Turks were compelled to withdraw, after suffering a loss of several thousand men. The city contains many relics of the occupation by the Knights of Malta. Population 38,000.

Valhalla (*văl-hăl'la*), in Scandinavian mythology, the "hall of the slain"—the abode of Odin in Asgard, the palace of Immortality, inhabited by the souls of heroes slain in battle. In the old Norse or Viking era, the *Eddas* relate, Odin and his chiefs dwelt in a sort of Olympus (Asgard)—the Norse Pantheon—which had two mansions, Gladsheim for the gods, and Vingolf for the goddesses. There also was Walhalla, wherein Odin placed one-half of the heroes slain in battle, the other half being received by Freija, the wife of Odin, who presided over smiling nature, sending sunshine, rain, and harvest. The roof of Valhalla was resplendent with gold; spears, shields, and armor adorned its walls. Out of this abode rode forth Valkyrs (or choosers of the slain) on invisible horses, to the battles of men on earth, and with their spears pointed out the heroes who should fall, whom they caught as they fell and bore to Valhalla in their arms. Troops of these invisible horsemen issued daily to engage in combat and return at night to be entertained with the never-ending hospitality of Odin. See the Norse prose *Edda*. Figuratively, Valhalla (or Walhalla) has come to mean a hall or temple, adorned with statues and memorials of a nation's great ones, especially its soldier heroes.

Valladolid (*văl-yă-dō-lēd'*), a famous city of Spain, at one time capital of the whole country, and still capital of the province of Valladolid, stands on the left bank of the Pisuerga, 150 miles northwest of Madrid by railway. It is 2,000 feet above the level of the sea, and has a healthful climate, the air being pure and genial and the sky generally cloudless. As Valladolid was the residence of the court prior to its removal to Madrid in the 16th century, it contains many large and decayed dwellings, although many new mansions have been erected and the streets have been paved, enlarged, and multiplied. There is a noted university, founded in 1346, a palace, and an unfinished cathedral. Here Ferdinand and Isabella were married and here Columbus died. The city communicates with the Atlantic ocean by the Douro, and with various portions of Spain by canal and railway. Population 68,746.

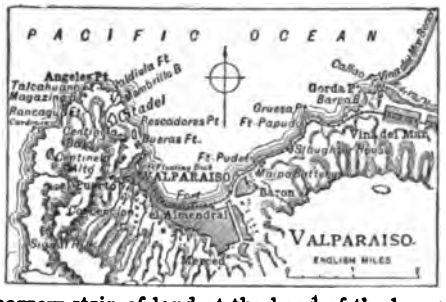
Val'ladolid', a town of Mexico, in the state of Yucatan, ninety miles southeast of Merida, stands in the midst of a highly cultivated tract of country. It is the best-constructed and healthiest town in Yucatan, and is the seat of cotton manufactures. Population 25,010.

Vallombro'sa, a celebrated abbey of Tuscany, situated among the Apennines in a valley surrounded with forests of fir, beech, and chestnut trees. Here an order of Benedictine monks was founded about the middle of the 11th century, who were called Vallombrosians, from the name of the site. This

monastery was suppressed in 1863, and its buildings used for a royal academy of forestry, but it is still much visited by artists and tourists.

Valois (*văl-wä'*), **House of,** a branch of the Capetian dynasty, which occupied the throne of France from 1328 to 1589, when it was succeeded by the house of Bourbon. It comprised the following princes: Philip VI. (1328–50), John the Good (1350–64), Charles V. (1364–80), Charles VI. (1380–1422), Charles VII. (1422–61), Louis XI. (1461–83), Charles VIII. (1483–98), Louis XII. (1498–1515), Francis I. (1515–47), Henry II. (1547–59), Francis II. (1559–60), Charles IX. (1560–74), Henry III. (1574–89). The Valois monarchs of the early line were generally able rulers, who, by valor and wise policy, resisted the invasions of the English and firmly established the royal authority over their nobility; but those of the later lines, with the single exception of Francis I., were weak and feeble princes, under whose rule the country was distracted by contests between the nobles, and by religious dissensions among the people at large, and only saved from greater calamities by the ability of the ministers of the crown, upon whom the government of the country devolved.

Valparaiso (*văl-pä-rī'sō*), the most important commercial town of Chile, South America, is situated nearly a hundred miles from Santiago, the capital, with which it is connected by railway. It is chiefly built on a



narrow strip of land at the head of the bay of Valparaiso. The town was nearly destroyed by an earthquake in 1822, and although it has been visited by a similar calamity a number of times since, its population has increased from 10,000 in 1825 to 143,022 in 1899.

Vam'bery, Arminius, a distinguished Hungarian traveler, and professor of Oriental languages at Budapest, was born in 1832. He has traveled widely in Persia and Central Asia, and published many works narrating his wanderings in Persia, in India, in Bokhara, and in Central Asia.

Vam'pire, according to a superstitious belief, which still prevails in some European countries, a ghost which comes out of the grave at night and sucks the blood of men and women. In the mythology of the ancient Greeks, beings of a similar nature existed, called the Lamias. These were beautiful women who allured youths to their embrace in order to feed on their flesh and blood. During the middle ages there was a prevailing belief that all persons who died under the ban of the church were sent forth by the devil at night to destroy other people; and it was thought that the only way to escape these vampires was by digging up their unwashed corpses and burying them.

Van, a fortified town of Turkey in Asia, stands near the southeast shore of lake Van, 140 miles from Erzrum. It is overlooked by a citadel now much dilapidated, but which from its lofty height could easily be rendered almost impregnable. The principal public buildings, in addition to the citadel, are the mosques, the Armenian churches, the caravansaries, and the bazaars. Van contains numerous ancient ruins, and cuneal inscriptions are found in which the name of Xerxes frequently occurs. Population 30,000. The lake of Van is an inland sea, 80 miles in length and 50 miles in extreme breadth. It is fed by about eight streams, and has no visible outlet. Its waters are salt, and the only fish caught are a kind of sardines, which are salted and exported throughout Asia Minor.

Van Bu'ren, Martin, eighth President of the United States, was born at Kinderhook, N. Y., Dec. 5, 1782. He commenced the practice of law at a very early age, and was elected to the New York state senate in 1812. After filling a number of other offices and taking an active part in the politics of the state, in 1821 he was chosen United States senator. He served a term of six years in that capacity, and was then chosen governor of New York. When General Jackson became President, in 1829, Mr. Van Buren was appointed secretary of state, but he resigned the office in 1831 in order to accept the position of minister to England. This appointment being made during the recess of congress, Mr. Van Buren proceeded to England, but as the senate refused to confirm the appointment he returned home soon after. This rejection by the senate probably caused his nomination and election to the office of Vice-president in 1832, General Jackson being re-elected President at the same time. In 1836, he was elected President of the United States, receiving 170 electoral votes out of 283; but although nominated for a second term by his party in 1840, he was overwhelmingly defeated by Gen.

MARTIN VAN BUREN.

William Henry Harrison, the electoral vote standing: Harrison, 234; Van Buren, 60. Mr. Van Buren was brought before the Democratic national convention of 1844 as a candidate, but his nomination was prevented by the adoption of the rule requiring a vote of two-thirds of the delegates to secure a nomination. In 1848, he was the candidate of the Free Soil party, but received no electoral votes. He died at Kinderhook, where the remainder of his life was passed, July 24, 1862.

Vancouver (*văn-kō'ver*) **Island,** a colony of Great Britain in the Pacific ocean, in lati-

tude 48°–51°. It is a little less than 300 miles in length with an average breadth of 30 to 50 miles; total area about 16,000 square miles. The main part of the island is a mountain ridge, which rises in its highest peak, Mt. Arrowsmith, to the height of 6,000 feet; but there are many undulating tracts along the coasts, thickly wooded in general, but containing here and there patches of open grassland. The shores are marked by abrupt, rocky cliffs and sheltered coves with fine harbors. There are no navigable rivers, and the streams, which are torrents in winter, are nearly dry in summer, being valuable only as power for grist and saw mills. The ocean that encircles its shores is of a remarkably low temperature throughout the year, owing to the Arctic currents that sweep along the coast, although the westerly winds blowing over the sea water modify the climate of the island considerably. Only a small portion of the island is suitable for agriculture, four-fifths being little better than barren rock. Victoria, the chief city of the island and the capital of British Columbia, has 20,821 inhabitants, while the population of the whole island is about 36,000. The western terminus of the Canadian Pacific railway is on the mainland opposite, thus bringing the island into direct communication with the Atlantic coast. Vancouver island was discovered by Spaniards in 1774, but was explored in 1792 by Captain Vancouver, an officer in the British navy, its possession secured to Great Britain by treaty in 1846, and in 1866 it was united with British Columbia. The town of Vancouver is a busy seaport, and has a population of 26,196.

Vandals, a race of European barbarians who contributed very largely to the overthrow of the Roman empire. They made their first appearance as an historic people in the 2d century A. D., and in the first part of the 5th century in company with the Suevi, Alani, and other German tribes invaded Gaul and ravaged and wasted it for three or more years. In the year 429 A. D., they crossed the strait of Gibraltar 50,000 to 80,000 strong under their leader Genseric, and carried devastation and ruin over northern Africa from the shores of the Atlantic to the frontiers of Cyrene. In 439, Genseric broke the peace which he had concluded with Valentintian III. and conquered Carthage, when a new peace was concluded which recognized the authority of the Vandals over northern Africa, and also over Sardinia, Corsica, and part of Italy. In 455, the Vandals captured Rome and plundered it for several days. The manner in which they mutilated and destroyed the works of art collected in the city has caused the term vandalism to be applied to all similar acts of barbarity. After the death of Genseric, his son Hunneric cruelly persecuted the Catholics and kept the Mediterranean in a state of almost constant alarm by his piracies. The Vandals continued to occupy northern Africa until 533, when the Emperor Justianian sent an expedition against them under the great general, Belisarius, with the result that they were completely conquered, and their chieftain, Gelimer, was captured and carried to Constantinople in triumph. Most of the Vandals were then drafted into the Roman army and "used up" in the wars with Persia, the few who remained in Africa rapidly disappearing among the natives.

Van'derbilt, Cornelius (commonly called "Commodore Vanderbilt"), was born on Staten island, May 27, 1794. At the early age of sixteen he showed signs of his genius and enterprise by running a boat of his own between New York and the island, and at twenty-three had accumulated nearly $10,000. In the year 1817, he associated himself with Thomas Gibbons in running the first steamer between New York and New Brunswick, N. J., serving as captain for several years. In 1829, he withdrew from the management of Gibbons' steamers, and for more than twenty years afterward built and operated steamers of his own from New York to various points, all of which proved very profitable. In 1851, he established a line from New York to San Francisco, which he sold to a company of which he himself became president two years later. During the Civil war he presented the government with his finest steamship, *The Vanderbilt*, which cost nearly $1,000,000, and about the close of the war withdrew his capital — amounting to many millions — from

steamships and invested it in the stock of various railroads. He soon had control of the New York Central, the Harlem, the Erie, and other roads, all of which he conducted with consummate ability and made more and more profitable. In 1873, he gave $1,000,000 to the endowment of Vanderbilt university, at Nashville, Tenn., for the education of southern youth. He died at his home in New York, Jan. 4, 1877, having bequeathed the bulk of his estate to his son, William H. Vanderbilt.

Vanderlyn (*văn'der-lin*), **John,** an American painter, was born at Kingston, N. Y., October 15, 1776, and after taking lessons in painting from Gilbert Stuart, visited Paris at the age of twenty and studied his art in that city for a number of years. He returned home in 1801, but in 1803 made another journey to Europe, where he remained till 1815. Among his works executed while in Europe were, *The Murder of Jane McCrea by the Indians* and *Marius sitting among the Ruins of Carthage.* His *Landing of Columbus* can be seen in the rotunda of the national capitol, and his portrait of *Washington* in the hall of the house of representatives. He died at Kingston, N. Y., Sept. 23, 1852.

Van Die'men's Land. See TASMAN'IA.

Van Dyke, or **Van Dyck,** Sir **Anthony,** was born at Antwerp, March 22, 1599. It is said that his talent for painting was fostered by his mother, who painted landscapes and was highly skilled in embroidery. After making considerable progress under Van Balen, he became a pupil of Rubens at the age of sixteen, who was not slow to discover his remarkable genius. In 1621, by advice of Rubens he visited Italy, remaining there five years. In 1632, he came to England on the invitation of the earl of Arundel, where a pension of $1,000 a year was settled on him. He died at London in the year 1641, leaving property to the amount of $100,000. It was only twenty years from the time when Van Dyke left the studio of Rubens until his death; and in that short period nearly 1,000 pictures of various kinds were executed by him. His best known works are representations of the crucifixion.

SIR ANTHONY VAN DYKE.

Van Dyke, The Rev'd. **Henry Jackson,** D.D., LL.D., American author and preacher, was born at Germantown, Pa., Nov. 10, 1852, and graduated at the Brooklyn Polytechnic institution, and Princeton college and Theological seminary. After taking a post graduate course at Berlin university he entered the ministry and held the charges successively of the United Congregational church at Newport, R. I., and of the Brick Presbyterian church, New York. The latter charge he resigned in 1899, to accept the Murray chair of English literature at Princeton university. In 1889 he was appointed preacher to Harvard university, and in 1893 delivered the Lyman Beecher lectures on preaching at Yale. He also delivered a memorial ode at the 150th anniversary of Princeton university, of which he is a trustee. He has been a contributor to many of the contemporary magazines and taken active part in religious work among the colleges. His writings embrace *The Poetry of Tennyson, The Reality of Religion, The Story of the Psalms, The Christ-Child in Art, Ships and Havens, The Lost Word, The Gospel for an Age of Doubt, Little Rivers, The First Christmas Tree, The Builders and Other Poems, Straight Sermons to Young Men, The Toiling of Felix and Other Poems, Fisherman's Luck and Some Other Uncertain Things,* and *The Ruling Passion.*

Vane, Sir **Henry,** was born at London in 1612, and was educated at Oxford, where he appears to have embraced the republican principles for which he became so famous. His travels in France and Switzerland strongly confirmed him in his opposition to the Church of England; and in 1635 he sailed for New England — the refuge of disaffected spirits in those days. He was chosen governor of Massachusetts, but his supposed heretical opinions soon destroyed his popularity among the Puritan settlers, and after a residence of a year or two in the new colony he returned home and entered upon a political career. When the war between Charles I. and the parliament broke out, no man was more active among the leaders of parliament than Vane. In 1646, Vane was one of the English commissioners for the preservation of peace with Scotland, and in 1648 was appointed to negotiate with Charles I. at the Isle of Wight. But he did not view with satisfaction the increasing power of Cromwell and the army, and was strongly opposed to the execution of the king. His views as to the rights and powers of parliament brought him into pretty sharp conflict with Cromwell, who is said to have exclaimed, when he dissolved his parliament in 1653, "The Lord deliver me from Sir Harry Vane!" When the restoration of Charles II. took place, Vane was one of the twenty persons exempted from the act of general amnesty; and in July, 1660, he was arrested and committed to the Tower. Two years later he was brought to trial at London, and although he defended himself with great ability and eloquence was found guilty and condemned to death. In response to a petition that Vane's life should be spared, Charles

wrote to Clarendon, declaring that he is "too dangerous a man to let live, if we can honestly put him out of the way." He was accordingly beheaded June 14, 1662.

Van Horne, Sir **Wm. Cornelius,** K. C. M. G., president of the Canadian Pacific railroad since 1888, was born in Will county, Ill., Feb. 3, 1843, and entered railway service in 1857. After filling various junior posts, he rose to be general superintendent of the Chicago and Alton, and subsequently of the Chicago, Milwaukee and St. Paul railroads. In 1884, he became general manager of the Canadian Pacific railroad, and in 1888 was elected to the presidency of the road. He was knighted in 1894.

Vanil'la, the generic as well as the common name of plants which yield the aromatic extract of commerce. The genus is a member of the orchid family, and is native to Mexico and Brazil, and is cultivated in various tropical countries. The aromatic extract is obtained from the long pods, known as vanilla beans, and their seeds.

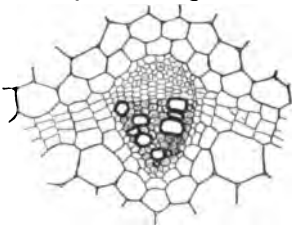
VANILLA.

Van Rensselaer (*van ren'se-ler*), **Stephen,** known as "the Patroon," an American statesman, was born at New York, Nov. 1, 1765. He was educated at Princeton and Harvard colleges, and married a daughter of Gen. Philip Schuyler, a distinguished officer of the Revolutionary war. He early gave his attention to politics, and in 1795 was elected to the New York legislature, afterward becoming lieutenant-governor and canal commissioner. At the beginning of the War of 1812, he was in command of the state militia, and led the assault on Queenston; but the refusal of a portion of his troops to cross the Niagara river enabled the British to repel the attack, and Van Rensselaer retired from the service in disgust. At his own cost he employed Professors Eaton and Hitchcock to make geological surveys of a large portion of New York and New England; he also employed Professor Eaton to deliver geological lectures throughout the state. In 1824, he established at Troy an institution for the education of teachers, with free pupils from every county in the state. About this time also he entered the lower house of congress and served several terms in that body with honor and distinction. He died at Albany, N. Y., Jan. 26, 1839.

Var'nish, a solution of some resinous material in any proper solvent, alcohol and oils being the ones chiefly employed. The solution must be of such a consistency as to be thinly and smoothly spread over the surface intended to be varnished, so that when it dries it will leave a thin resinous coating, which is either glossy or can be made so by mechanical polishing.

Var'ro, Mar'cus Teren'tius, "the most learned of the Romans," was born at the Sabine town of Reate, 116 B. C., and received his education first under Præconinus and then under Antiochus, a philosopher of the academy. He served with distinction against Mithridates, king of Pontus, and also against the Mediterranean pirates, but afterward, as legate of Pompey in Spain, he was compelled to surrender his forces to Julius Cæsar. He continued to share the fortunes of Pompey till after his defeat at Pharsalia, when he was pardoned by Cæsar, and employed by him to collect and arrange the great library designed for the public. When the second triumvirate was formed by Anthony, Lepidus, and Octavian, his name was on the list of the proscribed, but, after some time spent in concealment, he was received under the protection of Octavian, and the rest of his life was spent in the prosecution of his studies. He died in the year 28 B. C. Varro was not only the most learned of the Romans, but the most prolific Roman author. He himself confesses to have written no less than 490 books; but only two have survived, and one of these in a fragmentary state.

Vas'cular Bundles (in plants), often called "woody bundles." They form the great conducting systems of fern-plants and seed-plants, by means of which water with whatever it contains in solution passes from the roots which absorb it to the leaves which use it; and by which elaborated materials pass to points of use and storage. The movement of water from roots to leaves is commonly spoken of as the "ascent of sap" (but see Water, Ascent of). This great conducting system, composed of vascular bundles, is found only in fern-plants and seed-plants, which are often called "vascular plants," to distinguish them from moss-plants and thallus-plants, which do not possess vascular bundles. Each bundle consists of two distinct regions: (1) "xylem" or wood, that which contains the tracheæ or tracheids (see both); and (2) "phloem" or bast, that which contains the sieve vessels (which see). The xylem is concerned in the water conduction, and the phloem in food conduction. In an ordinary tree the whole wood mass is an aggregate of



A COLLATERAL VASCULAR BUNDLE.

xylem tissue, while the fibrous inner bark is the phloem tissue (see BARK). Different types of bundles are distinguished by the arrangement of their xylem and phloem masses with reference to one another. Those bundles, in which the xylem and phloem lie side by side on the same radius, the phloem always being on the outside, are called "collateral bundles," and are characteristic of the stems of seed-plants. Those in which the xylem is completely surrounded by the phloem are "concentric bundles," and are characteristic of the stems of fern-plants. Those in which the xylem and phloem alternate with each other around a common center are "radial bundles" and are characteristic of all roots.

Vas'sar College, founded by Matthew Vassar, the first well equipped institution for the higher education of women, is two miles east of Poughkeepsie, N. Y. It was incorporated in 1861 and opened in 1865. In the same year Mr. Vassar transferred to the trustees a farm of 200 acres, on which the college was to be built, and other property, the whole amounting to $400,000 in value. He increased this sum by other large gifts during his lifetime, and on his death bequeathed $400,000 more.

In accordance with the wish of Mr. Vassar, some of the instructors are men and some are women. The buildings are the main building, modeled after the Tuileries, observatory, laboratory, museum, conservatory, gate-lodge, gas works, boiler and pump houses, and farm buildings. The library contains 30,000 volumes, and the gymnasium, observatory, and laboratory are finely equipped, while the conservatory was added for assistance in the study of botany. There are 210 acres in the grounds, forming a beautiful park, with a lake for boating and skating. Besides the regular course for the degree of A.B., admission to which requires the same examinations as entrance to the leading colleges, there are schools of painting and music. In 1898, there were 60 instructors and 614 students; and the college is steadily growing in size and in influence.

Vas'sar, Matthew, American philanthropist and founder of Vassar college, was born in Norfolk county, England, April 29, 1792, and four years later accompanied his father to America, where he settled on a farm near Poughkeepsie, N. Y., his father establishing a brewery in that city. Young Vassar subsequently succeeding his father in this interest, he decided in 1845 to apply a portion of the profits derived from it to the endowment of a school for the higher education of women. This purpose he put into effect in 1861, by donating $400,000 to the institution in Poughkeepsie that became known as Vassar college. The success of the institution was gratifying and immediate. On Matthew Vassar's death, in June, 1868, he provided in his will for a further donation of $400,000 to Vassar. The institution has been since enriched by large sums donated to it by the nephews of Matthew Vassar, and to the endowing of memorial chairs, aiding the Literary and Scientific institute attached to the college, to the Vassar Brothers' hospital, and to the Home for Aged Men in Poughkeepsie. See VASSAR COLLEGE, above.

Vatican (*vat'i-kan*), the residence of the pope and the seat of the great library, museums, and collections of art, ancient and modern, which constitute one of the chief attractions of Rome for all visitors. Although the earlier popes had a residence in the Vatican, it is probable that no part of the present edifice is older than the pontificate of Nicholas V., who in the 15th century began the plan of improvement and embellishment of the Vatican which has made it the noblest of princely residences. Alexander VI., Julius II., and, above all, Leo X., pursued the same plan; and nearly all the succeeding popes have had some share in the enlarging of the building. Amid all the difficulties, financial and political, of his pontificate, Pius IX. made numerous improvements to the palace, the most striking being the great stair by which it is approached from the colonnade of St. Peter's. The building with its garden and appurtenances is said to cover a space equal to the whole area of the city of Turin, such as it was thirty years ago, with its 130,000 inhabitants. It contains several thousand separate rooms or apartments, some of them of unrivaled beauty and elegance. Among these may be specially mentioned the chapel of San Lorenzo, the Pauline chapel, the Sistine chapel, decorated in frescoes from the brush of Michael Angelo, the galleries and halls decorated by Raphael, Giulio Romano, and their scholars, the magnificent library, the galleries of antiquities, Christian and pagan, and of paintings, statuary, bronzes, medals, vases, and other objects of art.

Vat'ican, Council of, the great ecumenical council of the Catholic church in the years 1869–70, at which the doctrine of papal infallibility was formally promulgated. This council, composed of Roman Catholic prelates — some seven hundred and fifty in number — from all parts of the world, convened in the Vatican palace Dec. 8, 1869, and closed its deliberations Oct. 20, 1870, when this dogma was adopted by a practically unanimous vote. As formulated at the council, it contains the following propositions: (1) That a proper primacy or jurisdiction over the whole church was conferred on St. Peter directly, and not mediately through any delegation authorized by the church as a whole; (2) that this primacy rests by divine institution in the line of Roman pontiffs as St. Peter's successors; (3) that the pope's jurisdiction is immediate in all churches, all other bishops being merely his curates and deputies; so that not only on questions of faith and morals, but on questions of discipline and order, the entire church, both

priests and laymen, are bound to submit to his authority; (4) that it is unlawful to appeal from the pope to an ecumenical council as a higher authority; (5) that the pope, when he speaks *officially* and defines a doctrine of faith or morals to be held by the universal church, is infallible, and his utterances are not to be modified or changed.

Vaudois (*vō'dwä*). See WALDEN'SES.

Vaughan (*vawn* or *vau'un*), Cardinal **Herbert,** English Roman Catholic prelate, and the successor of Cardinal Manning as archbishop of Westminster, was born at Gloucester, England, April 15, 1832, and received his education at Stonyhurst college and at Rome. He was ordained a priest at Lucca in 1854, and returning to England he joined the Oblates of St. Charles, at Bayswater. He then became vice-president of St. Edmund's college, near Ware, and in 1869 founded and became president of St. Joseph's Foreign Missionary college, Middlesex, and three years later accompanied to Maryland a detachment of priests on a special mission to the colored people of the United States. In 1872, he was consecrated to the bishopric of Salford, and twenty years later was transferred to the see of Westminster. In 1893, he was created a cardinal of Rome, and two years later he laid the foundation stone of Westminster (R. C.) cathedral, a vast and stately edifice, in the Byzantine style, erected in London. In 1897, the cardinal took part in the celebration by the Roman Catholics of England of the 13th centenary of the landing of St. Augustine in Britain.

Vault, an arched roof, usually constructed of stone or brickwork. The simplest kind of vault is the semicircular arch extending from one end of an apartment to the other. Ordinary bridges are an example of this style of vaulting, which was commonly used by the Romans, who also built vaults with groins, that is, vaults intersecting one another. The Egyptians are also said to have been acquainted with vaulting; but the earliest remains of ancient vaults of any magnitude are among the Romans. The Roman vaults when groined were usually constructed with carefully cut stone so as to prevent the angle from chipping; but the mediæval architects had not the costly materials or skill of the Romans at command, so they formed only the groins of dressed stone, and filled in the vault with more common material. This led to the groins becoming a prominent feature in mediæval architecture, moldings and carvings being used for ornamentation. In modern architecture, vaults and arches are gradually being superseded by the use of iron constructions, both for roofs and for supporting floors, bridges, etc.

Vauxhall (*vaks-hâl'*), a famous public garden in London, established immediately after the Restoration in 1660, and continuing for nearly two centuries. It was situated in Lambeth, opposite Milbank, and near the manor called Fulke's hall, from which it derived the name of Vauxhall. The loose character of the amusements it afforded is freely sketched by the novelists and dramatists of the last century, and is further sketched in Thackeray's *Vanity Fair.*

Vec'tor is a term employed by mathematicians to denote a directed magnitude, that is, a quantity which has both direction and magnitude.

As examples of vector quantities may be mentioned, the distance between any two given points, a velocity, a force, an acceleration, angular velocity, intensity of magnetization, flux of heat.

Quantities such as a quart of water, a pound of sugar, temperature, a quantity of energy, which do not have direction, are called *Scalars.* See Maxwell's *Matter and Motion,* and **Tait's** *Newton's Laws of Motion.*

Veda (*vā'dä* or *vē'dä*), (literally, *knowledge*) is the name of those ancient Sanskrit works on which the first period of the religious belief of the Hindus is based. The oldest of these works is the *Rigveda;* next to it stand the *Yajurveda* and *Samaveda;* the fourth and latest being the *Atharvaveda.* The first three bear the collective title of *Trayi,* "the threefold," and all four are considered of divine origin. Each of these vedas consists of two distinct divisions—a *Sanhita* or collection of *mantras,* or hymns, and a portion called *Brahmana.* A *mantra* may be defined as a prayer or thanksgiving addressed to a deity in one form or another. If such a *mantra* is metrical and intended for loud recitation, it is called *Rich,* from *rich,* "praise"—whence the name *Rigveda;* if it is in prose it is called *Yajus,* from *yaj,* "sacrifice,"—therefore *Yajurveda* signifies the Veda containing such sacrifices. And if it is metrical and intended for chanting, it is termed *Saman*—hence *Samaveda* means the Veda containing such *Samans.* No special name is given to the *mantras* of the fourth Veda. Though the *mantras* and *Brahmanas* are both said to have existed from all eternity, there is abundant evidence that the *Brahmana* portion of each Veda was written some time after its *mantras,* for it refers to them, and it seems almost self-evident that both portions must have been the work of considerable time.

Ved'der, Eli'hu, an American painter, was born at New York city, Feb. 26, 1836, and after studying his art for some years both with Matteson and in Europe, opened a studio in his native city, where he won high reputation as a *genre* painter. He afterward returned to Europe and took up his residence at Rome, where he is now living. Among the pictures which rank him high as an artist may be mentioned *The Lair of the Sea-Serpent,* and *The Monk upon the Gloomy Path.*

Vega-Carpio (*vā'gä kär'pē-ō*), **Lope Felix de,** a celebrated Spanish poet, was born at Madrid, Nov. 25, 1562. From his in fancy he is said to have given promise of extraordinary talent. Like Pope, he "lisped in numbers." He was the idol of his time, and in productiveness at least surpassed all other poets, his dramas alone numbering 1,500 to 1,800, and in view of the quantity of his work its quality is no less surprising. The ease and grace of his versification are unsurpassed in the Spanish language, and his works are all instinct with life and dramatic movement. He is deficient in deep and serious qualities; but not withstanding this defect, he remains the chief ornament of the Spanish drama and a not inconsiderable figure in the dramatic literature of the world. The dramatist is generally referred to as Lope de Vega. He died at the home of his birth, Aug. 27, 1635.

Veii (*vē'yī*), an ancient city of Etruria and in early times the rival of Rome. Its very site is disputed, but it is now generally thought to be at Isola Farnese, about twelve miles from Rome. The struggle between the two cities is represented by Roman historians as commencing during the time of Romulus, and continuing under all the other kings except Numa, generally to the advantage of the Romans. At last the Romans determined to rid themselves of a rival by a siege, and persevered with great tenacity, although the city held out for ten years, and frequent attempts were made by neighboring states to relieve it. It is said to have been finally taken by means of a mine which was directed into the citadel. The citizens were massacred or sold as slaves, and the land confiscated by the conquerors. The fall of Veii took place 396 B. C., and after its fall it was gradually deserted. In later times a colony was planted there by Julius Cæsar, and afterward by Augustus, but it always remained an insignificant place.

Veins (in plants) are the extension of the vascular system into the leaves. See VENATION.

Velasquez (*vā-läs'kĕth*), **Diego Rodriguez de Silva,** one of the most famous of Spanish painters, was born at Seville in the month of June, 1599. At an early age he was placed in the studio of Francisco Herrera el Viejo, and afterward became the pupil of Francisco Pacheco, whose daughter Juana he married. In 1622, he visited Madrid, and while there painted so fine a picture of King Philip IV. that he at once became famous and secured the royal favor and patronage, which continued to the end of his life. In 1629, permission was granted Velasquez to visit Italy, where he was received with the highest honor, Pope Urban VIII. assigning him apartments in the Vatican. In the spring of 1631 he returned to Madrid, where he was cordially welcomed by his royal patron. He had a room assigned to him in the royal palace and the king would often visit him and watch him at his work. Additional honors were conferred upon him by the king from time to time until his death, which took place Aug. 7, 1660, his wife, who was passionately attached to him, surviving his loss only about a fortnight. With the possible exception of Murillo, Velasquez takes the highest rank among Spanish painters.

Velocity. See DYNAMICS.

Vel'vet, a fabric in which, besides the ordinary warp and weft, which are usually arranged as in twill weaving, there is an additional weft, consisting of short pieces of silk, cotton, or woolen thread doubled under the regular weft and brought to the surface in loops which are so close together as to conceal the regular web. The loops are afterward cut evenly, and the ends thus made constitute a covering resembling a very short fur. In silk velvets, the warp and pile threads are both of organzine silk, which is the strongest used in weaving.

Vena'tion, the arrangement of veins in leaves. The details of this arrangement are endless, but they may be reduced to two principal types. The two main types are known as closed and open venation. In the former case, while the veins branch, they always run into one another, never having free ends among the leaf cells or in the leaf margins. As a consequence, such leaves have even outlines, that is, they are not toothed or lobed. A very common form of the closed venation is that in which the main veins run parallel from base to apex, as in the grass blade, and leaves of other monocotyledons. Such leaves are called parallel-veined. In other cases of closed venation, as in palms, bananas, etc., the main veins are not parallel. The closed venation is characteristic of the monocotyledons. In "open venation," characteristic of dicotyledons, the ultimate branches end freely, either among the leaf cells, or in the leaf margins. Such leaves are said to be "net-veined," or "reticulate," and they are much inclined to become toothed, lobed, or compound. There are two forms of open venation: (1) "pinnate," or "feather-veined leaves," in which there is a main central vein or rib (midrib), from which the whole vein system arises; and (2) "palmate leaves," in which three or more main ribs rise together at the base of the leaf, and diverge upward. In the ferns the venation is open, but the veins fork repeatedly, such a venation being called "dichotomous."

Veneer', a layer of wood cut very thin for the purpose of being glued to the surface of a more common kind. Only choice kinds of hard wood are sawed into veneers, and they are usually attached to pine or some other kind of soft wood so as to give all the appear-

ance of being made solid. In this way the more costly kinds of furniture woods are economically used by the cabinet maker; for with the improvements that have been made in the process of sawing, veneers as thin as paper can be produced.

Venezuela (*vĕn'e-zwē'lă*), a republic of South America, bounded on the north by the Caribbean sea, on the east by British Guiana, on the south by Brazil, and on the west by the United States of Colombia (formerly New Granada). Area 593,943 square miles. The coast line, extending from east to west, from the delta of the Orinoco to the boundary line of Colombia, is about 1,500 miles in length. This coast line, which for the most part is low and marshy, is sometimes precipitous, the mountains rising almost like a wall from the water's edge. The great river of Venezuela is the Orinoco, which drains the greater part of the country, and whose course is almost wholly within its boundaries. The Andes mountains enter Venezuela from the west and divide into two branches, the first of which runs north toward the coast, but rises no higher than 4,000 feet, while the other, running in a northeasterly direction, terminates near the coast, and attains a greater elevation. The most mountainous districts of Venezuela lie south of the Orinoco. They form a vast, confused, and mostly unexplored region, but none of them rises to the height of the main peaks of the Andes. For the most part the soil of the country is fertile, and in the mountainous districts in the southeast there are great tracts suited for the production of grain. Agriculture is the chief pursuit, but only one-tenth of the soil is under cultivation. The inhabitants are made up of whites of Spanish extraction, Indians, negroes, and some mixed races. The religion of the mass of the people is Roman Catholic, although other forms are tolerated. In 1870, education was made free and compulsory. There are 1,450 federal and 150 state schools, besides nine barrack schools, four normal schools, over sixty colleges, and two universities. In Caracas, the capital, is the national library, with 32,000 volumes, and the national museum. It has 80,000 inhabitants. The northeast coast of Venezuela was discovered by Columbus in 1498. Ojeda and Vespucci followed in 1499, and entering Lake Maracaybo they found an Indian village constructed on piles to prevent the evil effects of inundation, and they thereupon named the place Venezuela, or Little Venice, a name which was afterward extended to the whole country. The first settlement was made at Cumana in 1520 by the Spaniards, and Venezuela remained subject to Spain till it claimed independence in 1811, was quickly subdued, but again revolted in 1813 and in 1815, and at last, forming with New Granada and Ecuador the Republic of Colombia, was declared independent in 1821. In 1831, the state separated, since which time Venezuela has maintained its separate independence. Population 2,323,527.

Venice (*ven'is*), a city of northern Italy, is built upon a crowded cluster of islets in the

lagoon of Venice, which is separated from the gulf of Venice by a long and narrow sand bank, divided into a number of small islands by narrow sea passages, six in number. Inside of this sand bank and between it and the mainland, about four miles distant, is the lagoon, in some parts of which islets have been formed firm enough to be built upon and fertile enough to be cultivated, and here the city of Venice is built. As the islands in many places afford no suitable foundations for buildings, the city is largely built upon piles or stone. In the vicinity of Venice, the ebbing tide lays bare a great plain of mud, laced by a network of narrow channels from which the sea never retires, while at high water the whole surface is covered by the sea to the depth of one or two feet. The fact that this city of marble palaces seems to rise like a vision out of the sea is sufficient to make it at all times an object of fascination, but in summer and autumn, the season of the highest tides, when the grand place of St. Marks is partially flooded, the city is indeed marvelously beautiful, and must continue to be a place of interest to travelers from all parts of the world as long as it stands. The present population of the city is 157,785. Although the many marshy islands extending along the northwestern shores of the Adriatic are known to have been used by the inhabitants of Venetia, one of the provinces into which Italy was divided by Constantine, as places of retreat from barbarian invasions as early as the 5th century, the first permanent settlement on the site of the present city of Venice cannot be traced farther back than the beginning of the 9th century. The physical conditions with which the early inhabitants had to contend could hardly have been more unfavorable to the development of a great and prosperous city.

The soil possessed no kind of mineral wealth, the thickets which diversified the surface of the barren marshes produced no valuable timber, good drinking water was hardly to be obtained; yet it was here that the Venetians by their energy, their industry, and their genius for commerce, succeeded in establishing and maintaining their independence, in making other nations their tributaries, in sending their fleets to distant shores, in controlling the destiny of empires, and in building up a naval power that is unique in the history of the world. Venice may be said to have risen out of the ruins of the Roman empire, and to have maintained its separate nationality through the middle ages and down to the year 1797, when Napoleon Bonaparte entered the city, proclaimed the republic at an end, and transferred her territory to Austria. In 1806, the city of Venice with the territory of Venetia was annexed to Italy by the treaty of Presburg, but it was again transferred to Austria in 1814, under whose dominion it remained until 1866, when it was once more incorporated in the kingdom of Italy.

Ven'ice, Gulf of, the name given to that portion of the Adriatic sea which indents the Italian province of Venetia to the extent of fifty or sixty miles.

Ve'nus, the Roman goddess of love, subsequently identified with the Greek Aphrodite. Originally, Venus does not seem to have occupied a conspicuous place in the religion of the Romans, and scarcely figures in the history of Rome under the kings; but gradually as the myth of the Trojan origin of Rome gained ground, the worship of Venus emerged into importance. Aphrodite was the mother of Æneas, and Aphrodite became Venus. Ares was Mars, and Mars was the national god of the Roman people; then, just as in Greek mythology, Aphrodite was beloved of Ares, so Venus was represented as the paramour of Mars, and thus was advanced by the poets to the dignity of the divine mother of the Roman people. Several temples were erected to her in Rome at different times and under different names, and rites were celebrated in her honor during the month of April — the springtime of the year being thought favorable to the growth of the tender emotions.

Ve'nus. See PLANETS.

Vera Cruz (*vā'rā krōs*), an important city on the east coast of Mexico, about 200 miles east of the City of Mexico, with which it has communication by railway. It is built in a semi-circle facing the sea, the streets, which are wider than is usual in tropical countries, running east and west from the harbor, with others crossing them at right angles. The town is defended by a wall six feet in height and other substantial works, as well as by the castle of St. Juan de Ulloa, which stands upon an island of the same name, about half a mile from the shore. Although Vera Cruz is the chief port of Mexico, it has no harbor worthy of the name, only an open roadstead between the castle and the town. The anchorage is bad, so that when the north gales prevail many vessels are wrecked on the adjoining shore. The chief exports are precious metals, cochineal, sugar, flour, indigo, leather, vanilla, etc., and the chief imports cotton, woolen, silk, and linen goods; brandy, iron, hardware, earthenware, etc. Population 24,085.

Vera Cruz was bombarded and taken by General Scott during the Mexican war, and again by the allied British, Spanish, and French squadrons in 1861, when they sought to set the archduke Maximilian upon the throne of Mexico.

Verazzano (*ver-rät-sä'nō*), **Giovanni,** Florentine navigator, was born at Florence, Italy, about 1480, and died, probably, about the year 1527 — being executed as a pirate, it is said, in New Castile. About the year 1505, it is known that he entered the French maritime service, made a voyage to the East Indies in a Portuguese ship in 1517, and became expert as an explorer and navigator. In 1522, he is said to have captured the rich treasure-ship in which Cortes was sending the spoils of Mexico to Charles V. of Spain. From the Madeira islands, he is further known to have sailed in 1524 on a voyage of discovery in American waters, and, on sighting Cape Fear, he coasted along until he reached what is now New York bay, continuing his explorations as far as Rhode Island and New Hampshire. It was on a second voyage to the New World (in 1527) that he was captured by Spaniards and hanged as a corsair — if that, indeed, was his fate.

Verdi (*vār'dē*), **Giuseppe,** Italian operatic composer, was born at Rancole in the duchy of Parma in 1814, and received his musical education at Milan. His first work was a musical drama, which appeared in 1839, and he has since produced a number of operas, which while they abound in melody and striking dramatic effects, are characterized by noisy orchestration. In 1861, he was elected to the Italian parliament, and in 1875 was made commander of the French Legion of Honor. He has also been decorated by the emperor of Russia and by the khedive of Egypt. *Il Trovatore* and *La Traviata* are, perhaps, his best-known operas. *Falstaff*, his latest production, was

GIUSEPPE VERDI.

first given at Milan, Feb. 9, 1893, attracting visitors from all over Europe, the seats being sold at $50 each. Verdi died at Milan, Jan. 27, 1901.

Verestchagin (*vā-rā-shä-gēn'*), **Vasili,** a Russian painter, was born at Novgorod, Russia, Oct. 26, 1842. In 1867, he was a soldier in Turkestan, and later in the Russo-Turkish war, in which he was wounded. He has produced numerous paintings, many of them scenes in East India, while others are war sketches. A collection of his pictures has been exhibited in New York, Chicago, and other American cities.

Ver'mes or **Worms,** the sub-kingdom made up of worm-like animals. Under this heading are included an immense number of animals that are so diverse in structure that the very general title of worm is justifiable only as applying to their form or shape. It embraces about a dozen classes whose relationships are imperfectly known. The interest in the group is considerable, because the worms show affinities with the higher animals, including even the vertebrates (which see). They are all animals with three cell-layers, a body cavity, and a nervous system consisting of a brain mass, on the dorsal surface, and a ventral nerve-cord divided into joints. The upper and lower parts of the nervous system are connected by a ring of nervous substance that surrounds the throat. From the central nerve-cord, nerve trunks are given off which branch profusely and terminate in minute twigs within the tissues. The digestive system is diverse, the circulatory system is imperfect, and there is usually a set of tubes or nephridia connected with excretion. The worms live in the sea and fresh water, in the earth and upon it, and as parasites within the interior of the tissues of various animals. They are divided into the jointed or *segmented* worms and the *unsegmented* worms. The former are more generally known and are mostly included under one class, called annelida. This class embraces the earthworms, the leeches, and a few forms living in the sea. The earthworm series have hair-like bristles (*setæ*) on each joint, which aid in locomotion. The leeches are not provided with bristles, but have two round suckers, one at either end of the body. Some of the leeches live on fishes, feeding on the mucus which comes from the bodies of those animals; others are bloodsuckers. The latter are provided with sharp jaws, located within the forward sucking disc, with which they cut the skin of the animals upon which they fasten. The unsegmented worms embrace the flatworms (*plathelminthes*) and the roundworms (*nemathelminthes*). Some of the former class live in the water and moist earth, and others of the same class are internal parasites, like tapeworms. The class of roundworms likewise includes forms living freely in the water and other substances as horsehair worms, vinegar and paste "eels." Examples of parasitic roundworms are the stomach worms and pinworms of children and the trichina. The latter is the most dangerous of the parasitic worms, getting into the system by eating raw or partly cooked pork. Besides the three classes mentioned, viz., annelida, flatworms, and roundworms, there is a fourth class called molluscoidea. Under this heading are grouped a few forms that have given naturalists no little trouble to classify. One division of them contains moss animals (*polyzoa*) of both salt and fresh water. They occur in branching colonies which resemble low plants in general form. The other division includes shelled-worms, called brachiopods, which were formerly included among the mollusks near the clams. See ROTIFER, and TRICHINA.

Vermil'lon, a bright scarlet color which is obtained from a native ore called cinnabar, or else made artificially from mercury and sulphur. This compound, sulphide of mercury, is thrown into tall earthen pots, and the lower parts kept red-hot. The substance volatilizes and coats the pots with cinnabar. The pots are broken and the cinnabar scraped off, ground and dried, when it is ready for use as vermilion. Cinnabar, the ore from which vermilion is obtained, is a compound of sulphur and mercury, of a blood-red color. It is simply ground fine, and then known as vermilion. The most important mines are those of Almaden in Spain, which have been worked for 3,000 years, and of New Almaden in California. There are mines in Brazil, Peru, Austria, Hungary, China, and Japan.

Vermont, a New England state, lying between New Hampshire and New York, on the Canada border. It is partly separated from New York by Lake Champlain, and from New Hampshire by the Connecticut river. It is 158 miles long, and 90 miles wide on the Canada border, tapering to 41 miles on the southern boundary. It covers 9,135 square miles. The Green mountains, running toward the southwest, divide the state into two nearly equal parts. The highest point is Mt. Mansfield, 4,389 feet high, and all the range, except the highest summits, is covered with evergreens, which give the green color from which the mountains and the state are named, Vermont meaning "green mountain." There are many small lakes, besides Lake Champlain, 118 miles long, and Lake Memphremagog, 30 miles long. These lakes abound in fine fish, and the larger ones make up to Vermont for her lack of access to the sea, 1,000 vessels entering the port of Burlington on Lake Champlain yearly. The second steamboat ever built was the *Vermont*, in 1809, which ran on Lake Champlain. The small rivers of Vermont are quite numerous, run through fertile valleys, and with the mountains and

lakes make up the beautiful scenery for which the state is noted. Though gold, silver, copper, lead, manganese, and iron are found, little effort has been made at mining, except of copper ore, which has been mined at Vershire and Corinth. The great mineral wealth of the state is in its quarries. The finest marble in the country, and three-fourths of all that is quarried in the United States, comes from Vermont. Rutland, a town in the marble region, has sidewalks, curbstones, and horse posts of white marble, finer than the celebrated marbles of Italy. There are also quarries of slate, granite, and soapstone, and mines of kaolin, talc, and manganese. Mineral springs abound, some of which are famous as summer resorts. Maple sugar is one of the special products of the state, and hay the largest crop; while the merino sheep of Vermont are exported all over the world. There are manufactures of cotton and woolen goods, tinware, scales, wagons, and machinery.

The state expends about $750,000 yearly for its public schools. In 1898, in the elementary schools, there was a force of 3,663 teachers and an enrollment of 63,260 pupils; in the high schools there were 135 teachers and 3,169 pupils. The University of Vermont, founded in 1800 at Burlington, has the state agricultural college connected with it, and departments of medicine, arts, chemistry, and engineering. Middlebury college, Norwich university, the first military school in the country, the Fletcher free library at Burlington, and the St. Johnsbury athenæum, are among the advantages for higher education. Montpelier, the capital, has a fine state house, in which are the cannon taken from the Hessians at the battle of Bennington, and the flags carried by Vermont regiments in the Civil war.

The first permanent settlement made in Vermont was in 1724 at Fort Dummer, now within the limits of Brattleboro. New Hampshire and New York both claimed the region, and titles were granted to the same lands by the governors of both states. The colonists, under Ethan Allen and Seth Warner, formed themselves into a company called the "Green Mountain Boys," and for years drove off the New York settlers. The state was finally admitted into the Union in 1791, buying off the claim of New York for $30,000. It was the first state admitted after the union of the original thirteen. In the Revolutionary war, the "Green Mountain Boys" fought the battles of Ticonderoga, Crown Point, and Bennington, and in 1812 were victorious at Plattsburg and at Lundy's Lane. The chief cities of Vermont are Burlington (population 18,640), Rutland (population 11,499), Barre (population 8,448), Montpelier (population 6,266), and St. Albans, (population 6,239). Population of the state 343,641.

Verna'tion, the arrangement of leaves in the bud, sometimes called *praefoliation.* Numerous names have been applied to various forms of vernation. Among the principal ones are "imbricate," in which the edge of a leaf overlaps its neighbor; "valvate," in which neighboring edges touch, but there is no overlapping; "conduplicate," in which the leaves are folded lengthwise; "convolute," in which the leaf is rolled from one margin; "circinate" (characteristic of ferns), in which the leaf is rolled from the apex downward.

Verne (*vĕrne*), **Jules,** a French writer, was born at Nantes, France, Feb. 8, 1814. He first wrote plays and opera pieces, and for some time was connected with a theatre. His wild and improbable stories have most of them been translated into English. The first one to make him known, published in 1863, was *Five Weeks in a Balloon.* It was based on modern science and had an air of reality. His other writings, except an illustrated geography of France, are of the same character. His works include *A Journey to the Center of the Earth, Twenty Thousand Leagues under the Sea, From the Earth to the Moon,* and *Around the World in Eighty Days.*

Vernet (*vĕr-nā'*), **Claude Joseph,** an eminent French painter, was born at Avignon, France, Aug. 17, 1714. When on a voyage to Rome, in a terrible storm, he was fastened to the mast, and the scene so impressed him that he became a painter of sea views, being considered the first marine painter in Europe. His best-known work is a series of the seaports of France, executed by royal order. His works have been extensively engraved. He died in Paris, Dec. 3, 1789.

Vernet (*ver-nā'*), **Emile J. Horace,** a French military painter, was born at Paris, June 30, 1789. His first military painting was the *Capture of a Redoubt.* His pictures of the life of Napoleon and the army, such as *The Dog of the Regiment, Soldier of Waterloo, Barrier of Clichy,* were very popular, and engravings of them could be found in nearly every cottage in France. Louis Philippe sent him to represent the French government at Rome. He traveled extensively, wrote several works on art, and made hundreds of designs for illustrated books. His fame rests on his military pictures, such as the battle pictures of Jena, Wagram, and Fontenoy, and the *Capture of the Imala.* He died at Paris, Jan. 17, 1863.

Ver'non, Edward, an English admiral, was born at London, Nov. 12, 1684. He was at the taking of Gibraltar in 1704, and was made a rear-admiral when only twenty-four years old. While a member of parliament, he declared that Porto Bello could be taken with only six ships of war, and when put in command of six vessels and sent to the West Indies, he took the city in one day, with the

loss of only seven men. The English people were wild over the victory; Vernon's birthday was celebrated in London with public illuminations, and 130 medals were struck in his honor. With a larger fleet he attacked Cartagena, but failed to take it. In the invasion of the Pretender, Vernon's fleet had command of the coasts of Kent and Sussex. On account of a quarrel with the officers of the admiralty, his name was struck from the list of English admirals. George Washington's elder brother, Lawrence, was with Vernon on his expedition against Cartagena, and afterward, in his honor, named the Washington home on the Potomac, Mt. Vernon. Admiral Vernon died in Suffolk, Oct. 29, 1757.

Vero'na, a city of northern Italy, is situated at the foot of the Tyrolese Alps, on the Adige river, sixty-two miles west of Venice. The fortifications, begun by the Romans and carried on by Charlemagne, were almost destroyed in 1801, but were rebuilt by the Austrians. The present fortifications are a circle of forts far outside the old city walls. It is a city of palaces; the Scaligeri palace, built in 1370, and those of the Canossa and Pompeii families in the 16th century are among the finest. Among the many churches are the cathedral, consecrated by Urban I. in 1187, and having Titian's *Assumption* on its walls; St. Anastasia, one of the finest Gothic churches in Italy; St. Zeno, rebuilt in the 12th century, and that of San Giorgio, with paintings by Paul Veronese. Among Roman antiquities is a ruined amphitheatre, built of marble and seating 22,000 people, much like the Colosseum at Rome. There are some fine streets and squares, many art collections, an academy of painting and sculpture, a theological seminary, a city library, and beautiful bridges across the Adige river. Its manufactures are of silk, linen, and woolen goods, and it has a trade in sumac, grain, and oil. The tomb of *Romeo and Juliet* has been destroyed, but another has been found to satisfy the curiosity of tourists. Verona was a Roman colony, its walls and gates having inscriptions dating from the 3d century. The ancient moat still remains as a canal around the old part of the city. It was taken by Constantine (312), Theodoric (489), and Charlemagne (774), and afterward became a free city. For 100 years it was ruled by the Scala family. In the 15th century it was conquered by Venice. The French took the city in 1796, and ceded it to Austria in 1797. Since 1866 it has been a part of the kingdom of Italy. Population 71,912.

Veronese (*vā-rō-nāz'ze*), **Paolo** (Paul), the name given to Paolo Cagliari, one of the great Italian painters, who was born at Verona in 1528 or 1532. His father was a sculptor and wanted to train the boy for the same profession, but his taste for painting was so decided that he was put under the teaching of an uncle, who was a painter. His first pictures were executed in the Church of St. Sebastian at Venice and were scenes from the history of Esther, *Baptism of Christ*, *Martyrdom of St. Sebastian*, and others. He was only twenty-eight at the time, but this work placed him at once in the same rank as Tintoretto, then forty-five, and Titian, then in his eightieth year. He obtained the commission for painting the ceiling of the library of St. Mark, and the work was so fine that even his rivals joined in voting him a golden chain as an honor. At Verona, his native city, he painted the *Banquet in the House of Simon the Pharisee.* His best-known work is the *Marriage at Cana*, now in the Louvre. It has about 120 figures or heads, many of them portraits, such as Queen Eleanor of France, Francis I., Queen Mary of England, Tintoretto, Titian, and Paul Veronese himself. Other pictures are *Susanna and the Elders;* the *Supper at Emmaus; St. Helena's Vision of the Cross;* the *Annunciation; Esther Presenting Herself to Ahasuerus;* and *Venice, Queen of the Sea.* He died at Venice, April 19, 1588.

Veron'ica, St. or **Bereni'ce,** according to tradition, a woman of Jerusalem who, moved with pity at the sight of Jesus bending beneath the burden of His cross on His way to Golgotha, gave Him her "kerchief" that He might wipe the drops of agony from His brow. Jesus after using it handed it back to her, with the image of His face marked upon it. With this napkin, Veronica is said to have cured Tiberius, the Roman emperor, when very sick, and so convinced him of the divinity of Christ that he sent Pilate into exile. The napkin, it is claimed, is now at St. Peter's at Rome.

Versailles (*ver-sālz'*), a city in France, eleven miles southwest of Paris, where Louis XIII. had a country villa, and where Louis XIV. built the finest palace in France, costing such an enormous sum that he destroyed the accounts. The marble court, the chapel, the halls and galleries filled with historical pictures (the collection made by Louis Philippe having five thousand works of art and costing $5,000,000), the battle gallery hung with pictures of French victories, the hall of Mercury, hall of Apollo, and galleries of war and peace, are among the many departments of this grand palace. The gardens surrounding it with their beautiful fountains and statuary attract crowds of visitors from Paris. The orangery has 1,200 orange trees, one said to be 465 years old. The grand canal, 200 feet wide and a mile long, in the time of Louis XIV., was covered with gondolas and lighted up with fireworks. The park connects with the two palaces, the Grand Trianon, a one-storied building with wings, and the Little Trianon, a pavilion with an English garden around it, the favorite residence of Marie

Antoinette. There are churches, a museum, a military hospital, and military school in Versailles, but no buildings of interest except the palaces. The treaty of peace, by which England recognized the independence of the United States, was signed at Versailles in 1783. The states-general of France met here in 1789 and bound themselves never to separate until they had given France a constitution. Louis XVI. was driven from Versailles to Paris and to prison. Louis Philippe restored the palaces at a cost of $5,000,000. During the Franco-German war it was the headquarters of the German army, and King William I. was proclaimed emperor of Germany there in 1871. It was the seat of government while the commune held Paris, and the French congress met there until 1871. Population 54,874.

Ver'tebrates, the highest sub-kingdom of animals. The difference between the backboned animals, and the lower animals without backbones, was recognized by Aristotle more than 2,000 years ago. It was not until the year 1797, however, that Lamarck founded the group vertebrata, and defined it with distinctness. For a long time the line separating the vertebrates and the invertebrates was supposed to be a very sharp one. But a more thorough study of animal structure showed that the vertebrates have many affinities with the invertebrates, and were doubtless derived from them. When the group was first founded, the distinguishing mark of vertebrated animals was supposed to be the possession of a backbone composed of bony vertebræ. But this idea has become so much modified that it is no longer used in defining the group. A Russian naturalist, Kowalevsky, showed in 1866 that the tunicates (which see) developed in the same manner as the lowest vertebrates, and, in their youth, approached very closely to the frog tadpole. This led to expanding the vertebrate group so as to include the tunicates, which were previously classed with the worms. Some other forms were later included for similar reasons. There are a number of forms, like the hagfish and lamprey, that have no bony spinal column, but are, nevertheless, true vertebrates. Therefore, the question arises, what are the marks of vertebrates that distinguish them from all other animals, and at the same time are possessed by all members of the group? There are three universally recognized features—besides some others of smaller importance. The three distinguishing features are:—

1. The possession of a nerve cord located on the dorsal surface, that of invertebrates being on the ventral side of the body. 2. A gristly rod, or notochord, that runs lengthwise through the body just below the nerve cord. This notochord is the scaffolding about which the bodies of the vertebræ are formed when they are present. 3. The possession of gill clefts. These structures are openings through the neck into the pharynx and are present in fishes throughout life. They appear, without exception, in the embryonic stages of all higher animals as hereditary survivals, but soon become closed, and disappear before the period of birth. See DEVELOPMENT OF ANIMAL LIFE.

It is not possible to trace with certainty the path along which the vertebrated animals have been developed, but they all possess some affinities (like jointed bodies and segmented kidneys) with the jointed worms, and the theory is widely accepted that vertebrates had remote ancestors that were very like the jointed worms. This is called the Annelid theory, and was founded in 1875, chiefly by Dohrn and Semper. It is to be remembered, however, that there are other rival theories, and no one claims that any living animals represent the ancestors of vertebrates. These ancestors, whatever they were, have been long extinct.

The vertebrate sub-kingdom is divided into five classes: fishes, amphibia, reptiles, birds, and mammals, all of which are further subdivided into orders, families, and smaller groups. The principal facts of importance in reference to the different classes will be found by consulting those topics.

Vespa'sian, Titus Flavius Vespianus, a Roman emperor, the tenth of the twelve Cæsars, was born in the Sabine country, 9 A. D. He held several Roman offices, as that of military tribune in Thrace, quæstor in Crete, ædile, and prætor. At the head of a legion in Britain, he conquered the Isle of Wight in 43. He was governor of Africa, the accounts of his reign there disagreeing; but whether a good or bad ruler, he was pelted with turnips by a mob. He was sent, in 67, to carry on the war in Judæa, and conquered almost the whole country, except Jerusalem, in two years. The civil war between Otho and Vitellius gave him the opportunity to profit by his popularity, and he was proclaimed emperor at Alexandria in 69. The army of the east stood by him and, entering Italy, defeated and put to death Vitellius, sacked Cremona, and took Rome after a terrible fight, in which the capitol was burned. Vespasian entered Rome in 70, where he restored the capitol, rebuilt the city, reorganized the army, and by his own example shamed the luxury and extravagance of the period. The Jewish war, under the lead of his son Titus, ended with the capture of Jerusalem, and the temple of Janus was closed, Rome enjoying peace for the nine years of Vespasian's reign. A new forum, the public baths, the temple of peace, and the Colosseum were begun in Rome in the reign of Vespasian. He favored men of letters, Quintilian among others, to whom he gave a pension of $4,000 a year. He died June 24, 79. See *History of the Romans under the Empire*, by Merivale.

Vespucci (*ves-pōō'chē*), **Amerigo,** an Italian navigator, was born at Florence, Italy, March 9, 1451. He began life as a clerk in the commercial house of the Medici, and in their employ was sent to Spain, where, at Seville, he entered the service of a Florentine merchant, who had fitted out the second expedition of Columbus, in 1493. Vespucci finished a contract his master had with the king of Spain to fit out twelve vessels for him. Vespucci, according to his own story, sailed first perhaps as an astronomer, with an expedition from Cadiz, May 10, 1497. After touching at the Canary islands, they reached "a coast which we thought might be that of a continent"—probably, from the description, Campeachy bay—and then sailed as far north as Cape Hatteras, returning to Spain in 1498. In a second voyage, in 1499, he reached the coast of Brazil, sailing north to the mouth of the Amazon and to San Domingo. He then entered the service of Portugal and made another expedition to Brazil, going as far as Georgia, and in 1503 he made his fourth voyage. Vespucci wrote a journal after his fourth voyage, but nothing of it remains except allusions to it. He also wrote several letters to a school-fellow in Florence, of one of which a Latin translation was printed in 1507. His claim that he reached the American continent in 1497, eighteen days before the Cabots, has been disputed, and the general opinion is that he did not make that voyage, but there is no evidence that he had any thought of taking the honor of the discovery of the New World from Columbus. The name America was first applied to the New World by a geographer of Freiburg, named Waldsermüller, who, referring to Vespucci's letter, says, "now a fourth part (of the world) has been found by Amerigo Vespucci, I do not see why we should be prevented from calling it Amerigo or America." Vespucci died at Seville, Feb. 22, 1512. See *Life and Voyages of Americus Vespucius*, by Lester; *Narrative and Critical History of America*, by Winsor.

Vest, George Graham, United States senator from Missouri, was born at Frankfort, Ky., Dec. 6, 1830, and graduated at Centre college, Kentucky, and at the law department of the Transylvania university at Lexington, Ky. In 1853, he removed to Missouri, where he practiced law, and became a member of the state legislature. During the Civil war, his secessionist leanings induced him to become a member of the Confederate congress and later of the Confederate senate. In 1879, he was elected Democrat member for Missouri in the United States senate, where he has been prominent in many important debates. He has since been reelected to the chamber continuously and has served on several committees on finance, on commerce, and on the transportation of meat products.

Ves'ta, in Roman mythology, was the goddess of fire and the domestic hearth. The guardianship of the sacred fire in her temples was given to priestesses, called *Vestal Virgins*, at first four, but afterward six. They were from six to ten years old when chosen, and spent thirty years in the service, the first ten in learning their duties; the second ten in acting as priestesses and guarding the sacred fire which must not be allowed to go out; and the last ten in teaching the new priestesses. If a vestal virgin violated her vow, she was stoned to death or buried alive. They lived in great splendor at the public expense, had the best seats in the theatres, and rode in state, preceded by a lictor. In Greece, the priestesses of Vesta, or Hestia, were widows. On the first day of March, the Latin New Year's Day, the sacred fire of Vesta was renewed. The Vestalia, the chief festival in honor of Vesta, was celebrated June 9, after which the temple was closed for five days for cleansing. In private houses, the feast was kept by eating fish, bread, and herbs before the hearth and the images of the Penates or household gods. The worship of Vesta died out in the 4th century, after the adoption of Christianity by Constantine.

Vesu'vius, Mt., the most celebrated volcano in the world, is on the bay of Naples in Italy. It is about 4,000 feet high, and has two distinct peaks, called Somma and Vesuvius, though it had but one in ancient times. It is about thirty miles around the base of the mountain, and the ascent on the west side is for three miles a gradual slope to the cone, which rises nearly 2,000 feet higher. The top of the cone is cut off, or truncated, and is 2,000 feet across, and the crater is 500 feet deep. About forty kinds of minerals are found around the cone in the ancient lavas. A rope railroad now carries visitors to within a short distance of the mouth of the crater, and an observatory has been built about half way up the volcano, to study the eruptions and watch for indications of an approaching earthquake. The region around Vesuvius has been densely populated for more than twenty centuries, in spite of its numerous eruptions. The great eruption of Aug. 24, 79, which destroyed Herculaneum and Pompeii, is the first one of importance. It was not lava but showers of ashes, condensed into mud by the rain produced by the steam of the volcano, that seems to have overwhelmed the cities below it. In an eruption, in 472, the ashes were carried to Constantinople, and in 1066 the lava flow reached the sea. The next great eruption was in 1631, when 18,000 lives were lost. A stream of lava 1,204 feet wide and 15 feet high destroyed the town of Torre del Greco in 1794. The eruptions increased in frequency in the last century, and the volcano is never entirely quiet. See *Volcanoes*, by Scrope; and *The Geology of Monte Somma and Vesuvius*, by Johnstone-Levis.

Ve'to, a word introduced from the Latin, meaning "I forbid." It is used to indicate the power possessed by the people or their rulers to object to an act of the legislature, and to prevent in some degree its being carried out. The Roman tribunes had the power of stopping the decrees of the senate by using the word "*interdico*" (I interdict); and so it is customary to say that the use of the veto began with them. In Poland, it was settled by law, in 1652, that in the imperial diet any deputy could hinder the passage of a measure by saying "*Nie dozwalam*" (I do not allow). In the national assembly of France, at the revolution, the king had a conditional veto, but Napoleon restored an absolute veto to the ruling power. The sovereign of England has the power to veto a bill of parliament, but the right has not been used since 1707. The veto in the United States is the power of the President to refuse his signature to a bill passed by both houses of congress; but congress can pass a bill over the President's veto by a majority vote of two-thirds in each house. President Jackson's veto of the bill to recharter the bank of the United States is one of the earliest instances of the use of this power by the President of the United States.

Vevay', a town of Switzerland, ten miles southeast of Lausanne, on lake Geneva. Its situation on the lake, with a range of mountains opposite, and the fine scenery near it, make it very attractive to tourists. It is built in a triangle, with a fine market place and two or three churches. Population 32,982.

Vi'a-Ma'la, a gorge in the canton of Grisons, in Switzerland, 1,600 feet deep, through which rushes the Hither Rhine, looking like a thread. It is about two miles long, and the great walls of rocks are so hard that apparently they have not been changed by the effects of the weather since they were thrust apart, and they are so near together in some places that a trunk of a tree or a stone may be wedged in between them. It was once considered inaccessible, and called the Lost Gulf, but a road has been built by blasting from 400 to 600 feet above the river, crossing from side to side by bridges, and protected by overhanging rocks or a wooden roof from falling trees and stones.

Vibur'num, a class of shrubs and small trees belonging to the honeysuckle family. Of the nearly eighty species about a dozen are found in the United States, growing in woods or hedges. The hobble bush, whose straggling branches catch the traveler's foot, is found in the northern states; the sheepberry or sweet viburnum, having clusters of fragrant flowers in May or June, and a blue-black, eatable fruit, and growing sometimes from 20 to 30 feet high; the arrowwood, with sharp teeth on its large-veined leaves; the maple-leaved viburnum, easily mistaken for a small maple tree, and called dockmackie in some parts of the country, are the most common varieties. The lamestinus, a native of southern Europe, with evergreen leaves and white flowers, belongs to the viburnums and is a favorite house plant.

Vichy (*vē'shē*), a town of France on the river Allier, celebrated for its mineral waters. There are twenty-one springs in the city or near it, the water of those outside the town being carried in by aqueducts. All the springs, whether hot or cold, are strongly impregnated with soda. The water is clear, with an alkaline taste. The bath houses can furnish 3,500 baths a day. There is a large trade carried on in the natural waters, and in the manufacture of salts for artificial baths. The visitors often number 15,000 yearly. Population 12,000.

Vicks'burg, a city of Mississippi on the Mississippi river, about half way between Memphis and New Orleans. The city is built on terraces rising up from the river, with streets narrow but well laid out. Situated in the finest cotton region of the country, it has a large trade in cotton, and manufactories of cotton-seed oil and cake, besides rolling mills, foundries, machine shops, breweries, and carriage and harness factories. Vicksburg was fortified and guns were placed to command the river in the Civil war as early as January, 1861. It was unsuccessfully attacked by Farragut, and also by Sherman in 1862, but on July 4, 1863, it surrendered to Grant. Population 14,834.

Vic'tor Emman'uel II., king of Italy, born at Turin, March 14, 1820, was the son of Charles Albert, king of Sardinia. After serving gallantly in the army, he became king of Sardinia by the abdication of his father, on the evening of the battle of Novara, March 23, 1849. From the Austrian conquerors of his country, he succeeded in obtaining the withdrawal of their demand that the Sardinian constitution should be abolished. This liberal constitution, granted by his father, he faithfully maintained, earning by this conduct the title of the "honest king," and winning the confidence of the Italian nation. He chose wise counselors, and with Cavour to guide, made many reforms, took part in the Crimean war, and visited Paris and London. With the help of the French, the battles of Solferino and Magenta were fought against Austria, but the peace of Villafranca between Austria and France left Italy still distant from its hoped-for unity. But Tuscany, Modena, Parma, and the Romagna voted for annexation to Sardinia, and the Prussian alliance in 1866 gave Venice to Italy. The French withdrew from Rome, and on Dec. 31, 1870, Victor Emmanuel entered Rome and became king of a united Italy. He reigned eight years, dying at Rome, Jan. 9, 1878. See *Life*, by Dicey, and by Godkin; *Italy under Victor Emmanuel*, by Arrivabene.

Victo'ria is a British colony in southeastern Australia. The river Murray forms its northern boundary, dividing it from New South Wales, and the ocean its southern. On the west is South Australia. It is 480 miles long and about 250 miles wide, and covers 87,884 square miles. The coast line is about 800 miles long, with Portland bay, Port Phillip bay, and Corner inlet as harbors. A chain of mountains, called the Dividing range, running nearly east and west, divides it unequally. The eastern part of the range, called the Australian Alps, is from 1,000 to 7,000 feet high Mt. Hotham, Mt. Smyth, and Mt. Selwyn, being high peaks. Along these ranges grow the giant trees of Victoria. The western part of the range is called the Grampians, where the principal peak is Mt. William. The western part of Victoria is level, with fine pastures for the merino sheep, whose wool brings the highest price in the markets of Europe. A part of it is covered with timber and reserved as a state forest. Many thousand square miles in the eastern part of the state are still unexplored, and more than ten millions of acres are so covered with forest-clad mountains as to be too wild for settlement. The streams are too small for navigation, except the Murray and the Yarra. The climate is very fine, about half the days of the year being bright, with a bracing, dry, pleasantly warm atmosphere. The temperature is never below the freezing point, except for an hour or two before sunrise, in the coldest month. Snow has fallen only twice at Melbourne, though common on the higher plains and mountains. The disagreeable feature of the climate is the north wind, cold and dry in winter, and hot and dry in summer. The trees of Victoria, among the largest in the world, are mostly the eucalypti or gum trees. The white gum trees are the most beautiful, standing in groves, with their long, branchless trunks, smooth as marble, looking like the pillars of a cathedral. The largest tree of this variety ever measured was 470 feet long and 81 feet around. Eucalyptus oil comes from the blue gum, and the red gum is used for timber, being almost indestructible. Magnificent ferns and fern trees are found in the Victorian forests. The kangaroo, opossum, wallaby, vandicoot, and wombat are among the peculiar animals of Victoria, all belonging to the class of marsupials (which see), and the parrot, cockatoo, and laughing jackass or kingfisher are among the native birds. Snakes are numerous, but not venomous. Wheat, barley, and oats are the principal crops, and almost all fruits except oranges and bananas are grown.

About one-third of Victoria is thought to contain gold, though only 1,300 square miles have been worked; 30,460 miners are employed, and the shafts used in mining are becoming very deep, one descending over 2,400 feet. Over $1,250,000,000 worth of gold has been already extracted. In 1899, the gold yield was 854,500 ounces, valued at over 17 million dollars. Besides gold, there is tin, copper, lead, bismuth, and zinc, while iron and coal occur in small quantities, but are undeveloped. All the important towns have good schools, and there are several colleges at Melbourne, the capital, a city of 491,000 inhabitants. The University of Melbourne has four faculties: art, law, medicine, and engineering. The governor is appointed by the British crown, but the country has its own parliament. In 1900, the colony furnished a military contingent for South Africa, to aid the Imperial Government in its war with the Boers. In 1901, Victoria was federated with the commonwealth of Australia. To mark the occasion, the colony was visited by the duke and duchess of Cornwall and York, as representatives of the British royal family.

The first settlement was made in 1835 at Port Phillip harbor. In 1851, gold was discovered, in 1852 there were 70,000 emigrants, and in ten years the population had increased six times. Population 1,163,400.

Victo'ria, the capital of British Columbia, is in the southeastern part of Vancouver island, on the strait of Juan de Fuca. The entrance to the inlet which forms its harbor is narrow and winding, and only the smaller vessels can enter; so the British naval station is at Esquimalt, three miles distant. The government offices, Cary castle, the governor's house, the free library, theatre, and several churches and schools, are among the best buildings. There is a public park, water works, and factories for making soap, sashes, iron, leather, and beer, and ship and lumber yards. Victoria was a port of the Hudson Bay company until 1858, and became a city in 1862. Population 20,821.

Victo'ria, queen of Great Britain and Ireland, and empress of India, was born at Kensington palace, May 24, 1819. She was the daughter of Edward, duke of Kent, and granddaughter of George III. At the death of her uncle, William IV., she became queen June 21, 1837, when eighteen years old. On Feb. 10, 1840, she married her cousin, Prince Albert of Saxe-Coburg-Gotha. When she came to the throne, she found Lord Melbourne, under whom her education had been conducted, at the head of her government, where he remained until 1841. His successors have

THE LATE QUEEN VICTORIA.

been such men as Robert Peel, Russell, Derby, Palmerston, Disraeli, and Gladstone. Under her wise leaders, the queen of England saw the country carried safely through the revolutionary period of 1848, the fall of the French monarchy, the formation of the kingdom of Italy, and the German empire, and the Civil war of the United States. Some of the important measures of the period are the adoption of the penny postage, abolition of the corn laws, the transfer of the East India company's possession to the crown, the Irish land act, and the admission of Jews to the house of commons. The most disturbing question of the period, which is still unsettled, has been the relation of Ireland to Great Britain. The Crimean war, the war in India at the time of the mutiny, the Abyssinian war, and wars in Egypt and Afghanistan are the principal military events of her reign. In 1861, her husband, known as the Prince Consort, died, and the queen lived in partial retirement until 1876, when she again opened parliament in person. In 1877, she was proclaimed empress of India. The reign of Queen Victoria was one of the longest and most prosperous in English history. She understood the relation between the crown and the people, did not oppose reforms, and left the government largely in the hands of her ministers, which justified her being considered the most constitutional monarch of Britain. The home life of the queen was also an example to her subjects, and earned for the royal family the respect of the civilized world. She had nine children, the oldest daughter being the late Empress Frederick of Prussia, and the oldest son, Albert Edward, now reigning as Edward VII. The Queen's Jubilee was celebrated in 1887, and the Diamond Jubilee in 1897. She died Jan. 22, 1901, after a reign of sixty-three years. See *Life of the Prince Consort*, by Martin; *Leaves from the Journal of Our Life in the Highlands*, by the Queen; *Life*, by Greenwood; *History of Our Own Times*, by McCarthy; and *Journal of Victoria's Reign*, by Greville.

Victo'ria Nyanza (*nī-ăn'zȧ*), one of the great fresh-water lakes of Africa, is crossed by the equator, and is about 3,308 feet above the sea. The word "Nyanza" means a large body of water. The lake was discovered by Speke, the African traveler, in 1858, and he explored the western and northern shores again in 1862. The lake flows into a beautiful river, with cataracts, called Ripon falls, Karuma falls, and Murchison falls, the last, a descent of 120 feet, entering the Albert Nyanza after a journey of 100 miles. This river is now called the White Nile, and Victoria Nyanza is considered to be the source of the Nile.

Vien'na, the capital of the Austrian empire, is on the Danube river. An arm of the river, called the Danube canal, passes through the city, and a little stream, the Wien, flows into it and gives its name to the city. Vienna is in a plain, bordered by hills, belonging to the Styrian Alps. There are two parts — the old town, and the suburbs. The streets of the old town, run to a point in the center, like the spokes of a wheel. Between the old town and the suburbs is an open space, from 600 feet to 1,500 feet wide, turfed, shaded with trees, and laid out in walks, which occupies the place of the old wall and fortifications. The suburbs, thirty-six in number, completely surround the old town and are encircled by a wall twelve feet high, with thirteen gates, called the "lines" of Vienna. Another wide boulevard goes around the city, which is sixteen miles in circumference. The old town is the most fashionable part of the city, and contains the palaces of the emperor and nobility. The people live in flats, none but the richest nobles occupying a whole house. The apartment houses, called Zinspalaste (tenement places), are many of them finely adorned with statues and other ornaments, and are quite a feature of Vienna. Other modern buildings are the museums of art and natural history, the palace of justice, the houses of parliament, the new court theatre, and the new opera house, one of the finest in Europe. The most important of the old buildings is the Cathedral of St. Stephen, one of the finest specimens of Gothic architecture in Europe, with a tower 450 feet high, the catacombs where the emperors are buried, and the tombs of Frederick III. and Prince Eugene of Savoy. The imperial palace dates from the 13th century, though additions have been made to it at various times. It has a library of 400,000 volumes, and fine collections of antiquities and curiosities. The University of Vienna, established in 1365, has nearly 6,000 students. There are also two theological seminaries, a conservatory of music, a military school, an academy of science, and an academy of art. The academy of art, the Belvedere palace, and some of the private galleries of the nobles, have very fine collections of paintings, antiquities, and armor. The Prater is a great park of 2,000 acres on the east of the city, where the great exhibition of 1873 was held. Vienna has a large grain trade, and also exports wine, cattle, and manufactured goods, such as carriages, iron ware, and cotton and silk goods, rivaling Paris in its leather and fancy goods, and being noted all over the world for its meerschaum pipes and bent-wood furniture.

Vienna was probably originally a Celtic settlement. It was taken by the Romans, called Vindobona, and made a military post. In 180, Marcus Aurelius died there. Attila and his Huns occupied it for a time in the 5th century; the crusades made it prosperous by the large trade they brought to it, and in 1276 it became the capital of the Hapsburgs. It was besieged by the Hungarians in 1477, taken by Matthew Corvinus in 1485, defended bravely against the Turks in 1529, and again in 1683. It was the meeting-place of the

congress of Vienna in 1814, where the affairs of Europe were settled after the downfall of Napoleon. Population 1,364,548.

Villafran'ca, a town of Italy, nine miles south of Verona. Its chief industry is the silk trade. It is known as the scene of several battles, including the defeat of Charles Albert, king of Sardinia, by Radetzky, the Austrian general, July 25, 1848, and of the Italians by the Austrians, June 24, 1866. It is also noted as the place where (July 11, 1859) the emperors Napoleon III. and Francis Joseph signed the treaty which gave Lombardy to Victor Emmanuel, called the peace of Villafranca. Population 9,729.

Villars (*vil'arz*), **Claude Louis Hector,** Duke of, a French general, was born at Moulins, France, May 8, 1653. His first service was in Holland and Germany. During the time of peace he was sent as an ambassador to Vienna and Munich. In the war of the Spanish succession he captured Kehl, defended the northeastern frontier of France against Marlborough, and took several towns in Alsace. He was defeated at Ramilies and wounded at Malplaquet. His brilliant campaign in 1712, in which he defeated the Austrians at Denain, compelled Prince Eugene to raise the siege of Landrecies, and took several towns; brought about the peace of Utrecht (1713), and the peace of Rastadt (1714). When more than eighty years old, in 1733, when the war with Austria began, he was given command in Italy, but soon asked for his recall, and died on his way home, at Turin, June 17, 1734. He was made marshal-general of France by Louis XV., a rank before conferred only on Turenne.

Vill'iers. See BUCKINGHAM.

Vincennes (*vĭn-sĕnz'*), **Ind.,** an old settled historic city, the capital of Knox county, on the Wabash river, in southwestern Indiana, 50 miles north of Evansville, and about 105 miles southwest of Indianapolis. It is served by four railroads, and has a number of fine parks and public buildings. From 1800 to 1813 it was the capital of Indiana and was originally a fort, erected in 1702 by the French. Here is the seat of Vincennes university, with 300 students, and of a Roman Catholic academy, and other educational institutions. It has a number of industries, including flour and woolen mills, packing houses, breweries, brick and tile works, and carriage and furniture factories, etc. Population 10,249.

Vin'cent, John Heyl, bishop of the Methodist Episcopal church and chancellor of the Chautauqua system, was born at Tuscaloosa, Ala., Feb. 23, 1832, and educated at Lewisburg and Milton, Pa., and in the Newark (N. J.) Wesleyan institute. After this he removed to Illinois and there held charge at Joliet, Galena, Rockford, Mount Morris, and subsequently at Chicago. Here he founded the *Sunday School Quarterly* and the *Sunday School Teacher*, containing the lessons that have become international. With Hon. Lewis Miller, of Akron, O., he established the Chautauqua assembly in 1874, and four years later founded also the Chautauqua Literary and Scientific circle, of which he has since been chancellor. He has been preacher at Yale, Harvard, Cornell, Wellesley, and other colleges, and is the author of *The Chautauqua Movement*, *The Church at Home*, *Our Own Church*, *Little Footprints in Bible Lands*, *The Modern Sunday School*, *The Church School and Sunday School Institutes*, *Earthly Footsteps of the Man of Galilee*, *To Old Bethlehem*, *Studies in Young Life*, etc.

BISHOP VINCENT.

Vinci, da (*da vĭn'chē*), **Leonardo,** an Italian painter, was born at the Vinci palace, near Florence, Italy, in 1452. He was celebrated as painter, architect, sculptor, musician, scientist, engineer, and mechanic, anticipating many of the great discoveries of astronomy and geology. He founded an academy of art; executed a model for an equestrian statue of Francesco Sforza; traveled through Tuscany as an engineer and architect; and designed the canal of Martesana at Milan. His celebrated picture, *The Last Supper*, was a fresco in a convent at Milan, now in a damaged condition. The best copy, by one of his pupils, is in the Royal academy, London, and the most celebrated engraving of it is by Morghen. His *Adoration of the Kings* was painted at Florence, as were several portraits, now in the Louvre at Paris. He went with Francis I., as court painter, from Milan to France, where he died, near Amboise, France, May 2, 1519. See *Life*, by Clement; *Legends of the Madonna*, by Mrs. Jameson.

LEONARDO DA VINCI.

Vine. See GRAPE.

Vin'egar is a weak form of acetic acid, generally produced by fermentation of the juices of fruit, which have already undergone

alcoholic fermentation, and varying in flavor according to the material from which it is made. In Great Britain, vinegar is usually made from malt, which is fermented in casks, which are three-quarters full, with holes for the entrance of air. They are kept at a certain temperature (about 70°), and the process may take weeks or months. The vinegar is then filtered and cleared. What is known as the German rapid process consists in pouring the malt or fermented wort in a shower on to shavings in a cask, and drawing off the liquid and pouring it in again, repeating the process until the vinegar has the right degree of acidity. Wine vinegar is largely made in France, and other wine-producing countries from the poorer wines, and the lees or settlings of the wine vats. It is white or red, according to the color of the wines used. In the United States, cider vinegar is considered the best, and the process is essentially the same as that used in making malt vinegar, warmth and exposure to the air being the two necessary conditions. Home-made vinegar is often produced by putting what is known as the vinegar plant or "mother" into a weak solution of sugar or molasses. The vinegar plant is found in old vinegar barrels and is a fungus growth similar to the yeast plant. The word vinegar means sour wine. See FERMENTATION.

Vi'olets, a class of well-known plants, found mainly in temperate regions. There are over 200 species, which are sometimes divided into stemless and leafy-stemmed violets. The common violet, found wild in the United States in pastures and woods, has heart-shaped leaves and flowers usually light or dark violet, though there are white and yellow varieties; the round-leaved violet, found in the northern woods with yellow flowers; the sweet white violet, the larkspur violet, arrow-leaved violet, Canada violet, etc., are among the many varieties. The English violet is prized for its fragrance, and is cultivated extensively for winter bouquets. The most showy and popular variety of the violet is the pansy, or tricolor, which has been introduced from Europe. Its irregular-shaped flowers, with their beautiful coloring, in white and shades of purple and yellow, are among our commonest garden flowers. They are said to have been first raised about 1810 by Lady Mary Bennett from a common weed. They are called pansies from the French word "*pensées*" (thoughts), "heartsease," "none-so-pretty," "love-in-idleness," "Johnny-jump-up," and "kiss me at the garden gate."

Vi'olin', a stringed instrument, which is played with a bow. It is a hollow wooden box, made from pine and maple, or sometimes deal and sycamore wood, with a solid handle, and is strung with four strings. The bow is strung with horsehair, and when drawn across the strings sets them in motion. The different notes of the musical scale are produced by stopping the strings with the fingers on a fingerboard on the handle. The quality of a violin depends upon the fineness and thinness of the wood, the curvings and arches, the strings, the varnish, the shape of the sound-holes or openings, etc. The best violins were made at Brescia, Cremona, Mantua, Milan, and Venice, where on the southern slopes of the Alps could be found the fine elastic pine best adapted to the purpose. Salo, Maggini, the Amati family, Joseph Guarnesius, called "Gesu," and Stradivarius are among the most celebrated violin makers of Italy; Norman was the first English maker of violins, and Jacobs and Kloz are well known among German artisans. The greatest of all violin makers is Stradivarius, born in Cremona, in 1644. He learned his trade of the Amati family, but made such improvements that all violins since, whether good or bad, are copies of his work. A fine violin of his manufacture will bring from $1,500 to $3,000. The Cremona varnish, very fine, brilliant, clear, and red of brown in color, but in its most beautiful form resembling amber, was used by these Italian artists, but the secret of its manufacture or the mode of applying it seems lost. The viol was the original of the violin. It was a stringed instrument with from five to fifteen strings, and the fingerboard was divided by frets—strips of metals—as in the guitar. The viola and violoncello are varieties of the violin, called also tenor and bass viols. The violin is also called fiddle, from the Anglo-Saxon "*fythel.*" Violins are now made mostly in France and in Saxony. See STRADIVARI.

Vi'per, the common name for several very poisonous snakes of the Old World. They have a triangular head and a robust body. The European viper, often called the asp, is widely distributed in Europe. It is about two feet long, of yellowish brown color, with black spots. In England, a similar form commonly called the adder, is the only venomous reptile known to inhabit Great Britain. In Africa, the most common variety is the horned viper with a horn-like scale over each eye. It lies partly hidden in the sandy wastes of northern Africa, awaiting its prey. It is possible that this is the asp used by Cleopatra in committing suicide. There are two vipers in India, one about twenty inches long and the other about four feet long.

Vir'chow, Rudolph, a German physician and pathologist, was born in Pomerania, Oct. 13, 1821. He studied medicine at Berlin, and lectured on anatomy in the university there. In 1848, he became a leader of the Liberal party and was elected to the Prussian house of deputies, losing his position in the university because of his liberal ideas. He was appointed professor of anatomy at Würzburg in 1849, and in 1856 was called back to Berlin and

put in charge of a medical institute, and given the chair of pathological anatomy in the university. The Prussian government sent him in 1848 to Silesia, to study the typhoid fever that was prevailing there; and the Bavarian government, in 1852, asked his aid in ascertaining the causes of a famine fever; while the king of Sweden begged him to investigate the leprosy that was extensive in the western part of Norway. He has been a member of the German congress and for a long time was an alderman of Berlin. He has distinguished himself in a number of different fields of learning. He is recognized as the originator of cellular pathology, and, on account of the general bearing of his studies, as one of the founders of modern biology. Since 1856, he has been director of the Pathological institute, Berlin. He has published a large number of scientific papers, a hand-book of *Special Pathology*, one on *Cellular Pathology*, etc. On his seventieth birthday, Oct. 13, 1891, he was given a public reception, attended by thousands of his friends and former pupils.

Vir'eo or **Green'let,** a class of birds somewhat like the shrikes. They are found in America, migrating usually in May from South America to the United States. They are very destructive to insects, but are sweet singers. The color is usually a shade of green, with white markings. They build their nests in trees and bushes, hanging them from twigs and making use of pieces of hornet nests, flax, and paper, which they glue together with the silk from the caterpillar or the saliva of birds. The nests are so strong that other birds and even mice will use them after they are deserted by their owners. The red-eyed vireo, the white-eyed vireo, the solitary vireo, and the "Whip-Tom-Kelly," are varieties found in the United States.

Vir'gil, Publius Virgilius Maro, a Roman poet, was born Oct. 19, 70 B. C., at Andes, near Mantua, Italy. He studied at Cremona, Milan (then Mediolanum), and Naples, his father, a small landed proprietor, evidently appreciating his son's genius and having him carefully educated. He was not a Roman citizen by birth and does not seem to have aspired either to military or to political distinction. When the lands of the country were seized for the benefit of the army, his father lost his small farm, but it was restored by Virgil's influence with Pollio and the young Octavianus (Augustus). He had, however, to escape by swimming across the river from the violence of the soldier who held possession of it. He lived in Rome for a time, where he had for friends Mæcenas, Varius, and Horace, and afterward at Naples and Sicily, and went with Horace on his famous journey to Brundusium. In 19 B. C., he went to Athens, intending to spend three years in Greece and Asia in perfecting his *Æneid*, which was finished, but met Augustus at Athens, and was persuaded by him to return to Italy. He died on the journey, Sept. 21, 19 B. C. at Brundisium.

His tomb at Naples was long held sacred and visited as a temple. His fame rests on three works: the pastoral poems or *Eclogues*, the *Georgics*, and the *Æneid*, though a few other poems are thought to have been written by him. The *Eclogues* were published in Rome in 37 B. C., and are poems treating of matters of current interest, connecting with them the love of home and of nature. The *Georgics* are said to have been written at the suggestion of Mæcenas, and treat of the life and work of an Italian farmer. The cultivation of the fields, the constellations which serve for a calendar, the signs of the weather, the culture of the olive and the vine, the rearing of herds and cattle, and the care of bees, are the subjects of the four books. His great work, the *Æneid*, is in twelve books, and gives the history of the wanderings of Æneas and his final settlement in Latium. He had not finished the poem to his satisfaction, and in his last illness is said to have called for the cases that held the manuscript, intending to have it burnt. He also left directions in his will that none of his unpublished writings should be given to the world, but the commands of Augustus prevented the loss of this great poem. The Romans were very proud of Virgil and his work; his writings were used as text-books, and copied by later poets, while various traditions made him looked upon as almost a magician. Dryden's and William Morris' translations of the *Æneid* are among the best English translations. See *Roman Poets of the Augustan Age*, by Sellar.

Virgin'ia is one of the thirteen original states of the Union. It is a rough triangle in shape, with its broad base resting on North Carolina and Tennessee, running along Kentucky and West Virginia on its western side, and Maryland and the Atlantic ocean on the eastern side. Its longest line from east to west is 476 miles, and from north to south 192 miles; the whole area being 40,125 square miles. It has a hilly region and a region of lowlands, as the southeastern part is a broad, undulating plain, nowhere rising more than 800 feet, while the northwestern part has parallel mountain ranges, reaching in their highest points 5,700 feet, with valleys between. The region next the Atlantic, on the Chesapeake bay, called Tidewater Virginia, is divided into five great peninsulas, with hundreds of smaller ones, giving a coast line of nearly 2,000 miles. This region going inland for 100 miles only rises from 12 to 100 feet above the sea. Midland Virginia and Piedmont are two of the six steps by which Virginia rises gradually from the seashore to the Appalachian mountains, and reaches to the fourth rise, the Blue Ridge country, which is diversified by the two portions of the range, and the fine table-

lands, at heights varying from 916 to 5,700 feet. The valley of Virginia, the next step, 300 miles long, is a part of the great Appalachian valley, stretching from Canada to Alabama, and lies between the Blue Ridge and the Kittatinny or North mountains, and, with its broad valleys, its mountain chains and rivers, forms one of the finest regions in the United States. The Appalachian region has high mountains and deep, trough-like valleys, and forms the grazing and timber region of the state, while beyond lies the Virginia portion of the tableland stretching westward from the Alleghanies, which is the coal region. The highest peak in Virginia is Mt. Balsam (5,700 feet), on the border of North Carolina. The Potomac, Rappahannock, York, and James, with their tributaries, flow into the Atlantic ocean through Chesapeake bay. The Great Kanawha flows into the Ohio river, and other small rivers into the Tennessee river. The climate is as varied as the country, and the productions vary with it from the market gardens, and sweet potato, cotton, and peanut fields of the low coast region; the tobacco, wheat, and corn crops, orchards and vineyards of the middle regions; the pasture lands and big cattle farms of the higher valleys; to the great forests of balsam, pine, and other trees with which more than half the state is still covered. The state is noted for its clear skies, pure air, and freedom from great storms.

The mineral wealth of the state is scarcely developed. Gold, silver, iron, copper, lead, zinc, coal, granite, marble, plumbago, salt, and gypsum are found there. There are some gold mines in the belt which extends from Washington to Halifax Court House, 200 miles long, and from 15 to 25 miles wide, and the manganese mines are the largest in the world. Salt is obtained from artesian wells, which reach down to a solid bed of salt. There are many mineral springs, some of which, notably the White Sulphur, have long been popular as summer resorts. The Natural Bridge of Virginia, with a span of 80 feet, 215 feet high and 100 feet wide, is one of the most remarkable natural arches in the world. The caverns of Luray, Weyer's cave, and Madison cave, the Crabtree falls, descending 2,000 feet, and the Dismal swamp, covering 150,000 acres, are among the peculiar features of the state. The crops of Virginia include the cereals, early fruits, and vegetables for the northern markets, peanuts, one of its chief productions, and tobacco, for which it is famous; sumac leaves and sassafras oil are also special products, and its oyster beds are very productive. The manufactures of the state include machinery, especially that used on rice, sugar, and coffee plantations, locomotives, cigarettes, tobacco, and canned fruits and vegetables.

The school system of Virginia dates from 1870, and costs the state about $2,000,000 annually. In 1898, there were 1,873 schools in the state, the elementary ones having 8,658 teachers and 354,859 pupils, and the high schools having 178 teachers and 3,966 students, besides seven colleges. The College of William and Mary, now used as a state normal school, was for more than a century one of the principal southern colleges and stands next to Harvard in age, being the second college founded in the United States. The University of Virginia, near Charlottesville, owes its existence mainly to Jefferson. The old buildings were designed by him. It has a museum of natural history, a Gothic chapel, an experimental farm, and an observatory with one of the largest telescopes in the world. Washington and Lee university, named first Washington college, in honor of Washington, who endowed it with property given him by the state of Virginia, after being presided over for five years by Robert E. Lee, received its present name from the legislature. Hampden-Sidney college, Emory and Henry college, Randolph-Macon college, Roanoke college, Virginia Military institute, Virginia Agricultural college, with the United States experiment station, St. John's Theological seminary, and the Hampden institute, a training school for negroes and Indians, are among the other educational institutions of the state. There are national cemeteries at Arlington, Ball's Bluff, Culpeper, Fredericksburg, Richmond, etc., a navy yard and naval hospital at Gosport, an artillery school at Fortress Monroe, and a home for disabled volunteers at Hampton.

The whole country from Cape Fear to Halifax was first named Virginia, in honor of Queen Elizabeth (the Virgin queen), after its discovery by Raleigh. The first permanent English settlement in America was made at Jamestown on May 13, 1607. The London company, under whom the colonists had been sent out, held by charter from James I. the land for 400 miles along the coast and 400 miles back into the interior, and all islands within 100 miles of the coast. In 1619, negro slavery was brought into the United States by the sale of twenty slaves brought to Jamestown in a Dutch man-of-war. In 1744, Virginia established a fort at Pittsburgh on the Ohio, which was taken by the French, and the French and Indian war followed, ending in the treaty of 1763, which left the Mississippi river as Virginia's western boundary. In 1784, the state ceded to the United States all the land beyond the Ohio, on condition that slavery should be prohibited in the new states formed out of the territory. in the war of independence and in that of 1812 Virginia was very prominent, giving the head to the Revolutionary army and also the first President to the new republic in the person of Washington, whose home, Mt. Vernon, on the Potomac, has been presented to the nation. In the Civil war, Virginia at first refused to secede, but later joined the southern confederacy, losing thereby the western

part of the state, which refused to join in the act of secession. The state suffered more than any other state in the Union, being the most important battleground of the country, on which were fought some of the most destructive contests of the war, which ended on the soil of Virginia at Appomattox Court House, as had that of the Revolution by the surrender of Cornwallis at Yorktown. The chief cities of Virginia are the capital, Richmond (population 85,050), and Norfolk (population 46,624). Population of the state 1,854,184. See *History of Virginia*, by Magill; *History of Virginia*, by Burke; *Early Settlement of Virginia*, by Neill.

Virgin'ia City, a city in Montana, on the eastern slope of the Rocky mountains, 110 miles south of Helena. It was the capital of the territory for ten years. It was settled in 1863, when gold was found in the Alder gulch, one of the most famous mining regions in the world. This district has since yielded $50,000,000 worth of gold. Population 800.

Virgin'ia City, a city of Nevada, about 180 miles northeast of San Francisco. It is on the steep slope of Mt. Davidson, about 6,300 feet above the sea. It is built over the great Comstock lode, the largest mineral vein in the world (which see). The city was founded in 1859, and grew rapidly with the influx of gold-seekers, until in 1875 it had 15,000 inhabitants. Since then the mines have been less productive and the present population is only 9,000. The Comstock lode was discovered by a Virginian, and this fact has given the name to the city.

Virgin'ia Creep'er, a vine belonging to the grape family. It is found in North America, and known by its glossy five-parted leaves, which become a bright scarlet in the fall, and its dark-blue berries. It grows 50 feet or more, clinging by tendrils to old walls and trunks of trees. It is also called American woodbine and American ivy, and is sometimes mistaken for the poison ivy. It can be distinguished easily by its five-parted leaves from the poison ivy, which has three-parted ones. A Japanese variety of the American creeper has been introduced, with variegated leaves, which is very popular, and hardy as far north as Boston.

Vir'gin Islands, a group of over 30 islands, lying to the east of Porto Rico, in the West Indies, with an area of fifty-eight square miles. About one-fourth of them are inhabited. Sugar, molasses, cotton, salt, turmeric, pimento, and ginger are among the products. Most of the islands belong to Great Britain, and since 1872 are included with the Leeward islands, the president of the British Virgin islands being under the authority of the governor of the Leeward islands. The other islands of the group belong to Denmark, except Crab island, which is owned by Spain. Columbus discovered the islands in 1494. They were secured by Britain by settlement in 1635, shortly after the British occupation of the Bahamas. The chief town is Roadtown, on Tortola island. The other principal islands of the group are Anegada and Virgin Gorda. To Denmark belong Santa Cruz, St. Thomas, and St. John. Population 4,691.

Vir'gin Ma'ry. See MARY.

Viscos'ity of Liquids, a term employed in physics to describe a kind of friction between the particles of a liquid when the various parts of the liquid are moving with different velocities. If a surface of area, A, in the liquid be chosen in a plane parallel to one of the fixed walls of the vessel, then the viscosity of the liquid is expressed as follows: Let V denote the velocity with which the liquid is moving at the surface A; and let D be the distance from the surface A to the fixed parallel wall.

Then if R is the tangential resistance experienced by the plane A,

$$R = \frac{n A V}{D}$$

where n is a constant for any one liquid and is called the *coefficient of viscosity* for that liquid. This coefficient is the measure of the viscosity of any liquid. It is the viscosity of water that causes water waves to "die down" after a storm.

Vish'nu, one of the Hindu gods, belonging to their trinity, which consists of Brahma, the creator; Vishnu, the preserver; and Siva, the destroyer. In the *Rig-veda*, a sacred book of the Hindus, he is considered to represent the sun. In his character as preserver of the world, he has descended several times, to set it right. These appearances are called "avatars," in which the god is supposed to have taken the form of some animal, god, or man. There are usually ten of these avatars mentioned, such as the man, the lion, the fish, the dwarf, the Buddha. One more appearance is looked for, when the "close of the present age shall be nigh." Vishnu is represented with four hands, holding a shell to be blown in battle; a disc, an emblem of power; a mace, a symbol of punishment; and either a lotus flower or a sword. He is sometimes represented floating on a serpent, seated on a throne, or riding on an animal half bird and half man. See *Hindu Pantheon*, by Moor.

Vis'igoths. See GOTHS.

Vision (*vĭzh'un*). See EYE.

Vis'tula, a river of Europe which rises in Austrian Silesia, and crossing Russian Poland and Prussia, flows into the Baltic sea at Dantzic. It is navigable to Cracow, 550 miles, and 100 miles below its source. At Vistula in Silesia, there are falls of 200 feet.

Vladimir (*vlă'dĭ-mĭr*) **the Great,** a Russian emperor, who reigned from 980 to 1015. He added largely to the kingdom by conquest, but is best known for the introduction of Christianity into the empire. He embraced the doctrines of the Greek church, and was baptized at Constantinople in 988, the day after his marriage to the sister of the Turkish czar. He died in 1015.

Vladivostok (*vlă'dē-vŏs-tŏk'*), the chief naval station of Russia in Siberia, is on the gulf of Peter the Great in the sea of Japan. It is situated on the point of a peninsula, called the Golden Horn, on a strait named the Eastern Bosphorus, with one of the finest harbors in the world. The climate is severe, but the gulf is frozen only along the shores, even in December. The navy workshops have been established at Vladivostok, which, with the discovery of gold in the neighborhood, has increased the importance of the place. Some 3,000 or 4,000 Koreans are employed in gathering seaweed, which is sent to the Chinese markets. The city is connected by submarine cable with Nagasaki and Shanghai; and in 1897 that section of the great Siberian railway was completed which brought Vladivostok into communication with the rest of the Russian empire. There is also a series of military posts and telegraph lines. Population 28,896.

Vogt (*fokt*), **Karl,** a German naturalist, was born at Giessen, July 5, 1817. At Neufchatel he studied natural history for five years under Agassiz. He was made professor of natural history at Giessen in 1847, but lost his position and had to leave Germany because of his zeal in the revolutionary movements of 1848. In 1849, he was made professor of geology at Geneva, and held that position to the time of his death, May 6, 1895. He claims to have written the first volume and a part of the second of Agassiz's *Natural History of Fresh-Water Fishes.* He wrote also *Studies in Geology and Petrefactions; Man, His Place in Creation and in the History of the Earth; Essays on the Darwinian Theory;* works on physiology, zoology, anthropology, and geology, and many scientific papers. His work on *Faith and Science,* published in 1855, is best known, and has been severely criticised for its supposed atheistic tendencies.

Voice is the sound produced by the movements or vibrations of the vocal cords in the larynx. The larynx is in the neck, between the trachea or windpipe and the pharynx, that part of the throat directly behind and below the mouth. The vocal cords are two elastic bands fastened across the larynx between which the air from the lungs passes out. The arrangement resembles two strips of india rubber stretched across the mouth of a glass tube, into which air is forced by a bellows, which would cause the edges of the rubber strips to vibrate with sufficient rapidity to produce a sound, the pitch depending upon the number of vibrations in a second. The first thing necessary to produce a sound is the expulsion or driving out of the air through the glottis or opening between the vocal cords, and the second necessary condition is that the cords should be close enough together and tight enough to vibrate rapidly. All the variations between high and low notes are produced by changes in the width of the opening and in the tension or tightness of the cords. If the cords are more than one-tenth of an inch apart there will be no sound. The pitch of the voice, depending upon the number of vibrations in a second, is determined by the length, size, and tension of the cords. The pitch of the male voice is lower than that of the female voice, because the cords are longer. A boy's voice "breaks" and falls about an octave at the period of life when the cords lengthen; and in old age the voice changes, because the muscles which move the cords lose their elasticity. Hoarseness is caused by roughness or swelling of the cords. The ordinary range of the voice is two octaves, while the ear can perceive musical tones for eleven octaves. The quality of the voice depends upon the strength and elasticity of the vocal cords, and also upon the shape of the passages of the ear, throat, and mouth, through which the sound passes, a slight difference in these respects causing the same varieties of tone, etc., in the human voice, as in a musical instrument. Voice differs from speech, which is the production of sounds to express ideas. Animals have voice without speech. In speech the tones produced by the voice are changed by the action of the organs of the throat and mouth, such as the tongue, lips, teeth, palate, etc., into a large number of simple sounds, which, put together, form words. These vocal sounds are divided into vowels and consonants, the different combinations of which produce the hundreds of thousands of words which form the languages. See *Human Physiology,* by Carpenter; *Voice, Song, and Speech,* by Browne and Behnke.

Volca'noes, vents in the earth's crust from which lava is ejected. The lava may flow out quietly, or it may be ejected forcibly. In the latter case, much or all of it may be solid. Small fragments of solid lava are called cinders, but if they are as small as particles of fine sand or dust, they are called ashes. Volcanic ash does not, however, imply combustion. It is nothing more nor less than powdered lava. Besides the lava which issues from volcanoes, either in the liquid or solid form, many gases or vapors escape from the vents. Among the latter, water vapor is most abundant. Steam is, indeed, the principal force in the violent expulsion of materials from volcanoes of the explosive type. Chlorine and sulphur, and various compounds of these

substances, are among the commonest fumes escaping from volcanic vents. Carbonic acid gas is also one of the common gases. Many of the gases are noxious, so that it is sometimes difficult to approach the openings whence volcanic products issue.

The solid material and the liquid lava which escape from volcanoes accumulate about the vents, and build up volcanic cones. In the top of a volcanic cone there is generally a depression, the *crater*, in the bottom of which the vent is situated. When a volcanic cone becomes high, the lava may break through its sides, instead of flowing over the top. Cones built up by lava flows have low slopes, often less than 5°, and rarely so much as 10°; cones built up by cinders often have steeper slopes, but rarely more than 25° or 30°. When a volcano ceases to be active, it is said to be extinct, if the quiescence be permanent. When it becomes extinct, however, it really ceases to be a volcano. When the activity of a volcano is temporarily suspended, the volcano is said to be dormant; but it is often difficult to tell whether a volcano is extinct or only dormant. Vesuvius was thought to be extinct until the time of its destructive eruption in 79 A. D. When this occurred, it was seen that the volcano had been dormant only, instead of dead. A volcanic vent often continues to give off vapors and gases long after the lava ceases to issue. Vapors and gases also escape, and often in quantity, during periods when no lava is ejected.

When volcanoes cease to be active, their craters may be occupied by water, giving rise to crater lakes. Such a lake, Crater lake, exists in Oregon. Volcanic cones retain their perfect form for a short time only. Erosion by rain and melting snow soon modifies them. Volcanic cones in all stages of degradation occur in many mountain regions. Mt. Shasta in California, Mt. Ranier in Washington, and the San Francisco mountain in Arizona, may serve as examples of volcanic mountains in process of degradation. In southern California and northern Arizona, there are volcanic cones so recently formed that they have been modified scarcely at all by erosion. In many of them the craters are still preserved. These fresher cones are largely of cinders.

Volcanoes are often associated with earthquakes, and the violent eruptions of volcanoes are often the direct cause of earthquakes. In many cases, however, it may be true that the two phenomena, the earthquakes and the volcanic eruptions, are to be referred to a common cause, rather than either one to the other. In the explosive eruptions of Vesuvius, the quakings are felt for considerable distances from the crater. In many cases of violent eruption, the old cones are partly or wholly blown away. Even large parts of the islands where they occur may be demolished. Outside the present cone of Vesuvius, there is a remnant of an older cone, partially destroyed in a violent eruption subsequent to its formation. A large part of the island of Krakatoa was blown away in the eruption of the volcano of the same name.

The great destructiveness of volcanic action is more commonly due to the material blown out than to the lava which flows out. The flow of lava is usually slow, and in most cases it flows but a short distance before it congeals. But the solid matter may be widely distributed. It was by ashes ejected from Vesuvius that Pompeii, with its 2,000 people, was buried in 79 A. D. Torrents of rain, due to the condensation of the escaping water vapor, often fall with the ashes, converting them into a sort of hot fluid mud, and this is sometimes most destructive in its flow. In the Krakatoa eruption of 1883, it has been estimated that bits of pumice and dust were sent up into the air 20 miles. Sent up into the upper air by the violent explosion, some of the dust was carried by air currents completely around the earth. Large blocks of lava are sometimes hurled miles from the volcano whence they are ejected.

The number of active volcanoes is estimated to be between 300 and 400. About one-third of the active volcanoes are situated on the continents, the others on islands. Most of the volcanoes on continents are relatively near their borders, though extinct volcanoes occur at great distances from the coasts. Continental volcanoes are, on the whole, more numerous about the borders of the Pacific ocean than about the Atlantic. Many islands are really nothing more than the crests of volcanic cones which have been built up above the surface of the water. There are doubtless very many volcanic cones the tops of which are still below sea level. Of such submarine volcanoes, little is known. The lava which issues from volcanoes comes from the interior of the earth, but from what depths is unknown. Active volcanoes are more numerous in regions where the formations are relatively young than where they are old. They are thought to occur in regions where the crust of the earth is in movement, that is, where it is either sinking or rising, rather than in regions where it is stable.

No existing volcano seems to have been active for a period of time which would be considered long, as geologists reckon time, though many of those now known have been active since the beginning of the historic period. There is, however, reason to believe that all existing volcanoes will, in time, cease to erupt, and new ones will doubtless come into existence. Volcanoes have been more numerous at some stages of the earth's history than at others, but some of the periods of great volcanic activity were early in the earth's history, and some late. On the whole, it cannot be affirmed that volcanic activity has increased or decreased as the history of the earth has advanced.

References: Judd's *Volcanoes* (Appleton); the topic "Volcanoes" in text-books on geology; Russell's *Volcanoes of North America* (Ginn); Geikie's *Earth Sculpture* (Putnam); Dana's *Volcanoes*. R. D. SALISBURY.

Vol'ga, a river in Russia, which rises in the western part of the country in the Valdai hills, and by a winding course crosses Russia and flows through many mouths into the Caspian sea. It is the longest river in Europe, being 2,320 miles in length. It is connected by canals with the Baltic and White seas.

Vol'ta, Alessandro, an Italian physicist, the inventor of the Voltaic cell, was born at Como, Feb. 18, 1745, where also he died, on March 5, 1827. From 1779 to 1819 he occupied the chair of physics in the University of Pavia.

His discovery of the "electric pile" (as the form of battery which he devised was then and is still called) begins with the division of all conductors into two classes, *viz.*, conductors of the first class, which become electrified by contact, but in such a way that equilibrium is at once established without any permanent current; and conductors of the second class — what we now call electrolytes. Volta's discovery is that whenever two conductors of the first class are joined in series with a conductor of the second class, an electric current flows through the closed circuit. This phenomenon was first reported by letter to Sir Joseph Banks, then president of the Royal society, on March 20, 1800, and was read before the Royal society on June 26, 1800. The centennial of this important discovery was recently celebrated by an electrical exposition at Como. Volta is also the inventor of the electrophorus and of an absolute electrometer. See ELECTRICITY.

Voltaire (*vol-têr'*), **Francois Marie Arouet,** a famous French writer, was born at Chatenay, France, Nov. 21, 1694. His father's name was Arouet. After studying at Paris, and in his father's law office, he began his career as a literary man. He spent a year in the Bastille imprisoned on suspicion of having written some verses which reflected on the government, and there finished his *Œdipe*. On leaving prison he changed his name to Voltaire, which is probably an anagram on his original name. His tragedy was successfully brought out in 1718, but *Artémire* was hissed off the stage. On a visit to Holland, he met Rousseau, of whom he made an enemy by a sarcastic reply to Rousseau's question: "What is your opinion of my *Ode to Posterity?*" "It is a letter that will never reach its address," was the answer. His visit to England, which was an exile, introduced him to the literary men and the literature of England. Through the favor of Queen Caroline, who headed the list of subscribers, his *Henriade* brought him nearly $40,000, making him independent of the great men in France whose patronage had been so injurious to him. In 1729, he was allowed to return to France, where *Brutus*, *Eriphile*, and his best play, *Zaire*, were produced at intervals. His *English Letters*, reflecting on everything in church or state in France, under the pretense of praising England, brought out in 1733 was condemned and burned, he himself being safely out of the way in Lorraine, where he lived for fifteen years with Madame du Châtelet, writing and studying Newton's *Principia*. His *Mérope* and *Mahomet*, among his best plays, belong to this period, as also his *Age of Louis XIV*.

His life at the Prussian court, as the friend of Frederick the Great, lasted three years, with the jealousies, squabbles, and court quarrels which Voltaire always succeeded in falling into. Being refused permission to return to France, he bought Ferney, an estate four miles from Geneva, which was his home for the last twenty years of his life. Here he was visited by many of the most celebrated men of Europe, carried on an immense correspondence, rescued from want and educated a niece of Corneille, interfered in several cases of oppression and injustice, and adopted a young girl whom he had rescued from a convent. After the death of Louis XV. he was permitted to return to Paris, and on Feb. 10, 1778, he entered the city after twenty-eight years of exile. He was received with enthusiasm, and crowned with laurel at the theatre where his new play *Irene* was produced. He died at Paris soon after, May 30, 1778. His works fill about ninety volumes, including the tragedies *Zaire*, *Merope*, and *Mahomet*, which give him a place with the best French dramatists; historical works, which embrace *Charles XII.*, *Louis XIV.*, and *Peter the Great;* philosophical works, poems, criticisms, and miscellaneous writings. See *Life*, by John Morley.

Voltam'eter. See GALVANOMETER.

Voorhees (*vôr'hēz*), **Daniel W.,** an American politician, was born in Ohio, Sept. 26, 1827. He studied at Asbury university in Indiana, and began his law practice in that state, where he was appointed district attorney. He was a representative from Indiana for four terms of congress, became United States senator in 1877, and was re-elected in 1885 and 1891. He died April 10, 1897.

Vosges (*vôzh*), a range of mountains on the left bank of the Rhine, in northeastern France and western Germany. The tops are rounded and called balloons, and are covered with snow for several months in the year. Mines of iron, lead, salt, and copper abound.

Vul'can (Greek, *Hephæstus*), in Roman mythology the god of fire, was the son of Jupiter and Juno. He was deformed in his feet, from his birth, according to some stories, while others assert that his lameness was due

to his being hurled down to earth by Jupiter for interfering in a family quarrel. He fell on the island of Lemnos, where he built a palace, with a workshop and anvil. He had also a beautiful palace in Olympus, or according to others in the heart of an island, where with the help of the Cyclops, he made the scepter for Jupiter, the armor of Achilles, and the weapons of Hercules. There was a temple to him at Rome, and a raised square outside the city called the Volcanol, where statues of persons struck by lightning were sometimes placed. There were also several festivals in his honor.

Vul'ture, the common name for various carrion-eating birds of the Old World. They are birds from two to four feet long, and the largest of them have an expanse of wing from nine to ten feet. Their head and part of the neck is destitute of feathers. There are six species more or less common about the shores of the Mediterranean. Two of these inhabit Africa and the other four are found in Europe. There, the crested black vulture is the type; it is one of the large vultures reaching a length of nearly four feet. It ranges east through Asia to China, and south into northern Africa. Other common species are the griffon, the nubian, or eared vulture, and the Egyptian vulture. These birds are called the true vultures; they are closely related to the eagles and to buzzards. A number of

EGYPTIAN VULTURE.

American birds, belonging to a different family, are also called vultures. They include the carrion crow, the turkey buzzard (which see), and the California vulture. See CONDOR.

W

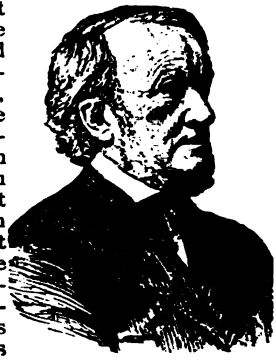
Wabash (*wŏ'bash*), a river of Indiana. It rises in western Ohio, runs through Indiana, forming for 100 miles the boundary line between that state and Illinois, and flows into the Ohio. It is 600 miles long, and is navigable for 300 miles.

Wa'co, a city of Texas, on the Brazos river. It is a prosperous manufacturing city and growing rapidly. There are fifteen public schools, one high school, four colleges, and Baylor university, founded by the Baptists in 1845. Population 20,686.

Wade, Benjamin Franklin, an American statesman, was born at Springfield, Mass., Oct. 27, 1800. He studied law in Ohio, and was three times elected state senator, becoming United States senator in 1851, again in 1857, and also in 1863. He was known as a strong anti-slavery man, being one of six senators who voted to repeal the fugitive slave law. He also opposed all the measures proposed as compromises between the north and the south, and was influential in getting the homestead bill through congress. After the death of President Lincoln, Wade was acting Vice-president of the United States. He died at Jefferson, O., March 2, 1878.

Wads'worth, James, a New York pioneer, was born at Durham, Conn., April 20, 1768. He with his brother in 1790 bought a large tract of land in what is now the town of Geneseo, N.Y., and became one of the great landowners of the state. He was very active in promoting the interests of religion and education in the new state, publishing pamphlets, paying for lectures on education, and giving a premium to any town that started a school library. A library was founded by him at Geneseo, and in all his land sales he insisted that 125 acres should be set apart for a church and 125 acres for a school. He died June 8, 1844.

Wagner (*väg'ner* or *wăg'ner*), **Wilhelm Richard,** a German musical composer, was born at Leipsic, May 22, 1813. He was educated at Dresden and Leipsic, and in 1836 was made conductor of the opera at Magdeburg. *Rienzi* and *The Flying Dutchman* were composed at Paris, where *Rienzi* was unsuccessfully put on the stage, but at Dresden it made him a musical conductor. For his next opera, *Tannhäuser*, he went to the old German songs, but the work was only partially successful when brought out at Dresden. During the revolution of 1849 in Saxony, Wagner was prominent as a leader and had to flee to Zurich, where he lived ten years, until allowed to return. *Lohengrin*, composed before he left Dresden, was produced at Weimar under the direction of Liszt in 1850, and in answer to Liszt's call for a new creation he began his collection of operas based on the *Nibelungenlied*. In order to bring out his "festival stage play," as he called his Nibelungen collection of operas, he built a theatre at Bayreuth, Bavaria. Founded on the old German poem, it was a great success, both in Bavaria and at London, where Wagner was present at its performance in 1877. His last and perhaps greatest work, *Parsifal*, founded on the story of the Holy Grail, was finished at Palermo, in 1882. He died at Venice, Feb. 13, 1883, and was buried at his home at Bayreuth. See HOLY GRAIL, and NIBELUNGENLIED. See also *Life*, by Nohl.



WILHELM RICHARD WAGNER.

Wagram (*vä'gram*), a village in Austria, ten miles from Vienna, important as the site of the great battle between the Austrians and the French in 1809. Napoleon surprised the Austrians under Archduke Charles by crossing the Danube at night, and was at first driven back; but the next day the French, with a loss of 25,000, forced the retreat of the Austrians, who left 25,000 dead on the field. This battle was followed by the peace of Vienna, Oct. 14, 1809.

Wain'wright, Richard, American naval officer, was born at Washington, D. C., Dec. 17, 1849 (the son of Commander R. Wainwright, who died near New Orleans while commanding Farragut's flagship *Hartford*, Oct. 10, 1862). Young Wainwright entered the Naval academy and graduated in 1868, when he was attached for a time to the brig *Jamestown*, on the Pacific station. Later on, he served on the Asiatic station, and after gaining a lieutenancy he did duty on the coast-survey vessel *Arago*. In September, 1894, he reached the rank of lieutenant-commander, and was executive officer on the battleship *Maine*, when she was destroyed in Havana harbor (Feb. 15, 1898). After this, he did good service at the battle of Santiago de Cuba as commander of the gunboat *Gloucester*, when Cervera's squadron was destroyed. He has since been in command of the ships of the United States navy at the Naval academy, Annapolis, Md.

Waite, Morrison Remich, an American statesman, was born at Lyme, Conn., Nov.

29, 1816. He graduated at Yale and began practicing law at Maumee City, O., afterward settling in Toledo. His reputation as a lawyer led to his being sent to Geneva, in 1871–72, as one of the counsel for the United States in the Alabama case. He presided over the constitutional convention of Ohio in 1873, and in 1874 was appointed chief-justice of the United States. He died at Washington, D. C., March 23, 1888.

Wake, from the Anglo-Saxon word meaning to watch, is a religious festival, once universal in England. The early churches were dedicated to a particular saint, and the festival was kept on the birthday of that saint. The day at the time was reckoned from sunset to sunset, so that the first part of the festival was the night watch, hence the name "wake." These festivals degenerated into fairs, because of the peddlers, etc., who were attracted by the crowds, and became scenes of riot. They were forbidden to be held in the country churchyards by Edward I., and Henry VI. abolished all selling at wakes, except of food, while Henry VIII. made the first Sunday in October the day of the feast. The wake is still observed in some country parishes in England. The Irish wake is the custom of watching all night around the dead, which is often accompanied by loud moaning, drinking, and even riot.

Wake-Rob'in, the common name of species of trillium, and also for the plant known as "Jack-in-the-pulpit." There are several varieties of the trillium, which is a species of lily. They grow in damp woods from Canada to Georgia, and are among our best-known wild flowers. There is usually a long stalk with a cluster of three leaves, with a single white or purple flower. The curious Jack-in-the-pulpit, which is called wake-robin in the south, has a large greenish or purplish spathe, or leaf-like envelop, turning over like a hood, which incloses a long finger-shaped stem, called the spadix. The calla lily belongs to the same family.

Waldenses (*wŏl'dĕn-sēz*) or **Vaudois,** a Christian denomination in Italy, founded about 1170 by Peter Waldo, a rich merchant of Lyons, who sold his goods and gave them to the poor, then went forth preaching voluntary poverty. His followers were called the "Poor of Lyons." They did not intend to secede from the church, but thinking it utterly corrupt, they sought to bring it back to its primitive purity. When the archbishop of Lyons commanded them to be silent, they appealed to Pope Alexander III., but he also forbade their meetings. Waldo, however, continued to preach, and with his followers was excommunicated. His doctrines spread in Italy, France, and Bohemia, and especially in the valleys of Piedmont, where the Waldenses were greatly persecuted during the 16th and 17th centuries. In 1680, they suffered at the hands of an Italian and French army, 3,000 being killed, 10,000 imprisoned, and 3,000 of their children being placed in different Catholic towns and villages. They had permission to emigrate the next year, and about 5,000 went from Piedmont to Switzerland, Holland, Brandenburg, Hesse, and Würtemberg. There are now ten congregations in Würtemberg, with over 16,000 members. When all Italy was opened to them, in 1858, they chose Florence as their center, removing there their theological seminary and printing press. They formed an Italian evangelical publication society in 1861, and have been especially active in printing religious books. They accept the Bible as their only rule of faith, but hold their *Confession of Faith*, published in 1655, as the most correct interpretation of it.

Waldersee (*väl'der-zā*), Count **Alfred von,** a German general, recently in command of the allied forces in China during the Boxer rising, was born at Potsdam, April 8, 1832, and entered the German army in 1850. He served with distinction through the war of 1866, and was chief of the general staff in the Franco-German war; he succeeded Von Molke as chief of staff in 1888, and in 1891 became commander of the ninth army corps. In 1895, he was created field-marshal, and in August, 1900, was appointed to the chief command in China of the allied armies engaged in suppressing the Boxer disturbances at Pekin and in the province of Pe-chili. In 1874, he married an American lady, widow of Prince Frederick of Schleswig-Holstein.

Wales, a part of Great Britain, is a peninsula on the western coast of England, lying between the Bristol channel and the Irish sea. It is 136 miles long and about 90 wide, with an area of 7,442 square miles, making it about as large as Massachusetts. It has a broken coast line of 360 miles, and is a mountainous country. The Snowdon mountains in the north, the Plinlimmon, and the Black mountains are the main ranges, with peaks over 3,000 feet high. There are several small streams, and only one lake, Bala. The country abounds in minerals; copper, lead, iron, coal, zinc, and silver are found, and remains of gold mines worked by the Romans. The climate is not severe, though somewhat cold and very damp. Butter, cheese, wool, and grain are among the most important products, and iron and flannel are the principal manufactures. All children between the ages of five and fourteen are required to attend schools provided for them, which are practically free. In 1897, Wales expended $200,310 on its secondary and technical schools. Among the higher institutions are: the University of Wales, consisting of the Aberystwith, Bangor, and Cardiff colleges; University college; St. David's college; St. Beuno's college; and colleges at Bala, Brecon, Llangollen, and Trevesca. The people are

of Celtic origin, and call themselves Cymri, the name Welsh being given them by the English. The English language is spoken in most of the large cities, but Welsh or Cymraeg, as they call it, is the language of the country. It is the best preserved of the Celtic dialects.

Wales was inhabited by three Celtic tribes when the Romans invaded it, but never conquered it. It was in constant warfare with the Saxons and the Danes, paying tribute to Athelstan, king of England, and later to Harold. William the Conqueror subdued it, and the English kings have ever since claimed possession of the country. In 1267, Llewellyn ap Gryffith was acknowledged prince of Wales by Henry III., but refusing to obey the call of Edward I. to parliament, was attacked and defeated. In 1282, he rebelled again, was slain in battle, his brother David, who succeeded him, was executed as a traitor, and Wales was united to England. The title Prince of Wales has been given ever since to the eldest son of the English sovereign. Under Owen Glendower the Welsh made a final effort for freedom, the struggle lasting fifteen years from 1400 till his death in 1415. Population 1,519,035.

Walhalla (*wŏl-hăl'la*) or **Valhalla** (the hall of the slain), in Scandinavian mythology, the hall where were gathered the dead who had fallen in battle. The hall, according to the legend, was in Gladsheim (the house of joy), with a grove of golden-leaved trees around it. It was ornamented with shields and spears, and had 540 doors so wide that 800 people could walk abreast through them. Every morning the inmates marched out at the crowing of the cock, and fought furiously until noon, when all wounds were healed, and they sat down to a banquet with Odin, where they were waited on by the Walkyries, or battle maidens.

Walker (*wâ'ker*), **Amasa,** an American political economist, was born at Woodstock, Conn., May 4, 1799, and died at Brookfield, Mass., Oct. 29, 1875. His early career was spent chiefly in commercial pursuits, but for six years (1842–48) he lectured on political economy at Oberlin college, and subsequently (1859–69) at Amherst. In 1848, he was a member of the Massachusetts assembly, and in the following year member of the state senate. In 1862–63, he sat in congress as member (Republican) for Massachusetts. He was a zealous advocate of temperance, was active in the anti-slavery movement, and was one of the founders of the Free Soil party. He was an authority in finance, and wrote a series of articles on political economy. In 1857, he published a work on the *Nature and Uses of Money*, and in 1866 issued *The Science of Wealth*. His son, Francis Amasa, was professor of political economy and history in the Sheffield Scientific school at Yale (1873–81).

Wal'ker, Francis Amasa, American statistician and political economist, was born at Boston, Mass., July 2, 1840, and died there Jan. 5, 1897. Graduating from Amherst in 1860, he took part in the Civil war and in 1865 rose to the brevet rank of brigadier-general of volunteers. He was wounded at Chancellorsville, and for a time was an inmate of Libby prison. In 1871–72, he was United States Indian commissioner; he was also chief of the bureau of statistics at Washington, and superintendent of the 9th and 10th United States censuses. From 1873 to 1881 he was professor of political economy in the Sheffield Scientific school at Yale, and in 1881 became president of the Massachusetts Institute of Technology at Boston. In 1898, he acted as United States commissioner to the international monetary conference at Paris, and in the same year was elected to the National Academy of Sciences, and made an honorary fellow of the Royal Statistical society of London. His published writings include *The Indian Question; The Wage Question; Money; Money, Trade, and Industry; Land and Its Rent; Political Economy; Bimetalism;* and a *History of the Second Army Corps.*

Wal'ker, Robert James, American statesman and financier, was born at Northumberland, Pa., July 19, 1801, and died at Washington, D. C., Nov. 11, 1869. Graduating at the University of Pennsylvania in 1819, he studied law and practiced first at Pittsburg, Pa., and then at Natchez, Miss. Here he came into notice as an opponent of nullification, and from 1836 to 1845 was United States senator from Mississippi. In 1845, he was secretary of the treasury in Polk's cabinet, and prepared and carried what was then known as the "Walker Tariff." In 1857, he became governor of Kansas, and in the years 1863–64 was financial agent of the United States in Europe. Throughout the Civil war, he remained loyal to the Union and advocated vigorous measures for the suppression of the rebellion. In later years he practiced law at the capital, where he died in his 68th year.

Wallace (*wŏl'ăs*), **Alfred Russel,** a distinguished English traveler and naturalist, was born at Usk, Monmouthshire, Jan. 8, 1823, and received his education at the Grammar school at Hertford. From an early age he manifested a great love of nature, with marked scientific tastes. This bent was greatly developed in a voyage he made, in company with W. H. W. Bates, a naturalist, to South America, an account of which he has given us in his *Travels on the Amazon and the Rio Negro*, with a fund of material on the physical aspects of these great water-systems, enriched by valuable botanical and ornithological collections. Of this voyage we have further results in his *Palm Trees of the Amazon, and Their Uses*, and *Tropical Na-*

ture, dealing with the colors of bird, animal, and insect life, and on the geographical distribution of plants and animals, sexual selection, etc. A prolonged visit to the Malay islands (1854–62) is the source of his work on *The Malay Archipelago*, published in 1869. This and a volume entitled *Contributions to the Theory of Natural Selection* give him place alongside Darwin as an exponent of evolution — his views on natural selection and variation being, like Darwin's, an explanation of the mode of origin of existing species of animals and plants. A little volume (issued in 1889) explains his theories in regard to evolution and Darwin's work: the volume is entitled *Darwinism*. Two other works from his pen also throw valuable light on the evolutionary theory, *viz.*, *Natural Selection* (1870), and *The Geographical Distribution of Animals* (1876). For these labors, Doctor Wallace received the founder's gold medal of the Royal Geographical society, the gold medal of the Linnæan society, and the first Darwin medal of the Royal society. Among his other published works are a volume on *Australasia*, contributed to Stanford's *Compendium of Geography and Travel; The Wonderful Century, Its Successes and Its Failures* (1898); *Island Life* (1880); *Miracles and Modern Spiritualism* (1874); *Bad Times* (1885); and *Land Nationalization* (1882), comprising his views as a social reformer.

Wall'ace, Lewis, an American general and writer, was born at Brookville, Ind., in 1827.

GEN. LEW. WALLACE.

His military service was in the Mexican war and in the Civil war, where he commanded a division at the capture of Fort Donelson, and guarded Cincinnati when besieged by Gen. Kirby Smith. In July, 1864, though defeated by General Early, who was marching on Washington, his attack detained the Confederate forces until Grant had re-enforced the capital. He was governor of Utah from 1878 to 1881, and minister to Turkey from 1881 to 1885. His writings include *The Fair God*, a story of the conquest of Mexico; *Life of Benjamin Harrison*, *The Boyhood of Christ*, *The Prince of India*, and one of the most popular books of the kind, *Ben Hur, a Tale of the Christ*.

Wall'ace, Sir **William,** the most popular national hero of Scotland, was born about 1270. While studying at Dundee, so tradition relates, he killed a young Englishman in revenge for an insult, and was outlawed. He gathered around him a band of desperate men, whom he led in attacks on the English. His followers and his successes increased until the English king recognized it as an insurrection, and sent an army against the insurgents, when most of the nobles deserted Wallace. He fled to the north, soon collected another army, and drove the English from Scotland, and was chosen guardian of Scotland in 1297. The English renewed the contest, and the Scottish nobles again deserting, Wallace was defeated at the battle of Falkirk, 1298, and a price put upon his head. He was captured and executed as a traitor, Aug. 22, 1305, though he denied the accusation of treachery, saying he could not be a traitor to the king of England as he had never been his subject. See *Early Days of Wallace*, by Bute; *Life*, by Carrick; and *Tales of a Grandfather*, by Sir Walter Scott.

Wallachia (*wo-lā'kī-ā*). See RUMANIA.

Walla Walla (*wŏl-a-wŏl'a*), (meaning "many waters"), **Wash.,** a city on the Walla Walla river, capital of the county of the same name, in southeastern Washington, 245 miles east of Portland, 75 miles southwest of Lewiston, Idaho, and 125 miles south of Spokane. It is the seat of a United States military post, and of the state penitentiary. Here, also, is located Whitman (Congregational) college, and a number of important educational institutions. It is a considerable trade center, especially for the region about (an agricultural, fruit-growing, and stock-raising one), including northern Idaho and northeastern Oregon. It is situated on the Union Pacific railroad. The city has ample water-power and has a number of manufactories, including flour-mills, foundries, and machine shops; lumber, sash, door, and blind factories; iron and wire-fence works, etc. Population, which has more than doubled in the past decade, 10,049.

Wallenstein (*wŏl'en-stīn*), **Albrecht Eusebius von,** was born in Bohemia, Sept. 24, 1583. After the death of his parents, who were Protestants, he was sent by an uncle to the Jesuit college at Olmütz, where he joined the Catholic church. His studies at Altdorf, Bologna, and Padua resulted principally in a faith in astrology and trust in the stars. He served in the Hungarian army, and on the side of the emperor in the troubles in Bohemia, securing in the confusion the large estates belonging to his mother's family, and confiscated lands, which he formed into a state called Friedland, and in 1623, was given the rank of prince. In 1626, Wallenstein raised an army of 30,000 men for the Emperor Ferdinand, and joined with Tilly, the great German general, against Christian IV., who was obliged to accept terms of peace in 1629, though Wallenstein had failed in his plan of reaching the sea, and destroying the naval power of Scandinavia and of England. He

secured for himself the duchy of Mecklenburg. His success, ambition, and arrogance made the princes of the kingdom combine against him, and to prevent civil war the emperor, in September, 1630, removed him from the head of the army; but with the advances of Gustavus Adolphus, he was recalled, and in 1632 with an army of 40,000 men, he drove the Saxons from Bohemia and attacked the Swedish army at Nuremberg and Lützen, where, though Wallenstein's forces were defeated, Gustavus Adolphus was killed. Wallenstein failed to follow up the advantage this gave the Austrians, as he was secretly negotiating with Saxony, Sweden, and France, with the condition that he should be given Bohemia. He had blind confidence in his army, and in his destiny, as foretold to him by his astrologers, and did not realize his danger, though knowing that the emperor knew of his plans, until an order was issued at Prague, charging him with treason, and naming his successor. He fled with 1,000 followers to Eger, where he was assassinated, Feb. 25, 1634. Though the deed was not ordered by the emperor, the murderers were rewarded. See *Wallenstein's Death*, by Coleridge; *Life*, by Mitchell; *The Thirty Years' War*, by Schliler; *The House of Austria*, by Coxe.

Walloons (*wo-lönz'*), the name of the people living in southeastern Belgium, who differ from the rest of the Belgians by language and by their darker color. They are descendants of the Belgæ, a tribe of Gauls, who held their ground among the Ardennes mountains when the rest of Gaul was overrun by German conquerors. Their language is a French dialect, with a large proportion of Gallic words. The name "Walloon," that is, Welsh or "foreign," was given them by their Flemish neighbors. They are steadily increasing in numbers, and are likely soon to overbalance the Flemish population of Belgium, as they already take the lead in everything, except music and painting. They number about two and one-half millions.

Wal'nut, species of *Juglans*, and native of the temperate regions of the northern hemisphere. They are fine forest trees, and also yield most valuable timber. The nuts of various species are well known. The "English walnut" is *J. regia*, and is the common walnut of commerce. The common "black walnut" of the eastern United States is *J. nigra*, well known for its fine dark timber, as well as for its characteristic nuts. The "butternut" or "white walnut" of the same region is *J. cinerea*.

Wal'pole, Horace, earl of Orford, an English author, was born at London in 1717. He studied at Eton and Cambridge, traveled in Italy, and took his seat in parliament in 1741, but was never active in public life. His home at Twickenham, near London, called "Strawberry Hill," adorned with vast collections of pictures, books, manuscripts, armor, etc., was one of the sights of the time, and admittance was granted by ticket to parties of four from May to October. His writings include *Castle of Otranto*, *Memoirs of the Last Ten Years of the Reign of George II.*, *Memoirs of the Reign of George III.*, *Catalogue of Royal and Noble Authors*, *Historic Doubts on the Life and Reign of King Richard III.*, *Anecdotes of Painting in England*, and *Catalogue of Royal and Noble Authors of England*. But his fame rests upon his *Letters*, which are the product of years of acquaintance with public men and events, and entitle him to the rank of one of the best letter writers in English literature. He died March 2, 1797. See *Letters*, edited by Cunningham; *George Selwyn and His Contemporaries*, by Jesse; and essay on *Letters of Horace Walpole*, by Macaulay.

Wal'pole, Sir **Robert,** earl of Orford, an English statesman, was born at Houghton, in Norfolk, England, Aug. 26, 1676. He studied at Eton and Cambridge. Entering parliament in 1701, he became secretary of war in 1707, and treasurer of the navy in 1709. He defended the Whig party with both voice and pen, and his political enemies brought against him a charge of corruption, for which he was expelled from the house of commons and imprisoned in the Tower. With the accession of George I. he became in succession privy councilor, chancellor of the exchequer, and first lord of the treasury. Jealousy among the Whigs and the opposition of the German favorites of the king compelled Walpole's resignation in 1717, but in 1721 he was again called to power, and remained prime minister of England until 1742. His policy was to maintain peace abroad and quiet at home, and during his administration the country was very prosperous. The difficulties between King George II. and the Prince of Wales led to his resignation, when he was made earl of Orford. Charges of bribery were brought against him, but failed to be supported, though he doubtless did not scruple to gain his ends by this means. He died in 1745. See *Memoir of the Life and Administration of Sir Robert Walpole*, by Coxe.

Walpur'gis Night is in Germany the night in which the witches and wizards hold their yearly gathering, the largest being the one held on the Brocken in the Harz mountains. It was originally a vigil kept the night before May 1, in honor of St. Walpurgis, a sister of some early English missionaries to Germany, who established convents in that country, but it was changed with the belief in witchcraft to its present signification.

Walrus (*wŏl'rŭs*), a marine carnivorous mammal, closely related to seals and sea lions. It is known by its enormous down-turned tusks, or canine teeth, projecting from the upper jaw. They sometimes reach a length

of sixteen inches beyond the sockets. Walruses have a thick clumsy body, deepest at the shoulders, and their feet, which are adapted

WALRUS.

for swimming, are also furrowed so as to hold on to smooth surfaces. They reach a length of twelve feet or more and a weight of 2,200 pounds. There are two living species, one found in the Atlantic and one in the Pacific. The Atlantic form is still found on the coast of Labrador and Hudson bay, but formerly extended further south. The Pacific form is more northern, being rarely found on the mainland. They feed largely on clams and other mollusks, which they dig from the sea bottom with their tusks. They visit islands and ice floes, and congregate in considerable numbers during the breeding period. They are hunted for their hides and oil.

Walsall (*wôl'sôl*), a town in Staffordshire, England, eight miles northwest of Birmingham. Its churches and most of its public buildings are all modern. Harper's almshouses founded by James I., memorial cottages for twelve poor couples or widows, and cottage hospital are among its charities. It has a public library, town hall, guildhall, theatre, and schools, including a grammar school founded in 1554. Its situation in a region of extensive coal mines and limestone quarries, with iron, stone, and brick clay near, makes it a manufacturing town, with iron and brass foundries. Locks, keys, bolts, pulleys, and all kinds of ironware used in making carriages or harness are special manufactures. Walsall was fortified by Ethelfleda, daughter of Alfred the Great, held by William the Conqueror as a royal house, belonged to Richard Neville Warwick (the king-maker), and was given by Henry VIII. to the duke of Northumberland. Population 74,789.

Walsingham (*wol'sing-am*), Sir **Francis**, an English statesman, was born at Chiselhurst, Kent, in 1536. He studied at Cambridge. He was distinguished among Queen Elizabeth's ministers for his acuteness and knowledge of public affairs. He was sent on an embassy to France in 1570, to the Netherlands in 1578, to France again in 1581, and to Scotland in 1583. He was secretary of state to Elizabeth, and managed foreign affairs by a system of spies, having had, it is said, nearly sixty, "agents" in his service. In this way he got possession of the correspondence of Mary, Queen of Scots, which was used to prove her guilty of conspiring against the life of Queen Elizabeth, and he was one of the commissioners at her trial. He died April 6, 1590.

Waltham (*wôl'tham*), a city of Massachusetts, on the Charles river, ten miles northwest of Boston, is a suburb of that city. It has a Swedenborgian theological seminary, a free public library, and numerous schools and churches. It is known all over the world for its machine-made watches, of which about 1,400 a day are turned out. There are also cotton cloth, hosiery, machinery, paper, boots, and shoes produced, and there are bleaching and dye works. It was settled in 1630. Population 23,481.

Walther von der Vogelweide (*vâl'ter fon der fō'gel-vī'de*), (Walter of the Bird-Meadow), a German minstrel or minnesinger, was born in Tyrol, between 1165 and 1170. He was attached to the court of Duke Frederick of Austria, at Vienna, for many years, and at his death went from court to court after the fashion of the minnesingers. His early poems were love songs, but the crusades and civil troubles of Germany furnished the subjects of his later verses. He stands in the front rank of the lyrical poets of his country. He died in 1228 at Würzburg, where Frederick II. had given him a valuable estate. A monument was erected there to his memory in 1843, and a statue of him at Innsbruck in 1877. See MINNESINGERS, and LITERATURE, GERMAN.

Walton (*wôl'ton*), **Izaak**, a famous English author, and the "Father of Angling," was born at Stafford, England, Aug. 9, 1593, and died at Winchester, England, Dec. 15, 1683. He was engaged in trade in London, as a linen-draper, between the years 1624 and 1644, and made a competence, upon which he retired and devoted himself to literary pursuits, and to angling, of which he became a renowned exponent. Besides his quaint and fascinating treatise on the rod — *The Complete Angler, or the Contemplative Man's Recreation* (1653), he wrote a series of sketches of English divines, embraced in what is known, in their collective character, as *Walton's Lives*. These sketches dealt with Dr. John Donne, Richard Hooker (the judicious Mr. Hooker), the poet and divine George Herbert, Bishop Robert Sanderson, and Sir Henry Wotten, the English diplomatist and author. *Walton's Lives* have deservedly found a place in the best literature and are sure of a long immortality. Considering the stormy era in which he lived, that of the great English rebellion (1642-80), waged by the Parliamentary army against Charles I., and on to the Restoration, it is curious to note the serenity of mind and life of Master Izaak Walton.

Wal'worth, Reuben Hyde, an American lawyer, was born at Bozrah, Conn., Oct. 26, 1789. He settled at Plattsburg, N. Y., where he began his law practice, moving afterward to Saratoga. He was a member of congress, circuit judge, and chancellor of the state for twenty years. He was considered an authority on all matters connected with courts of equity, and was one of the greatest lawyers of America. He died at Saratoga, N. Y., Nov. 21, 1867.

Wampum (*wŏm'pum*), the name of Indian money, consisting of strings of shells and shell beads, which were worn as ornaments. They were used mostly by the Algonquins, and were made on Long Island and around New York. The white wampum, called "wampumpeag," was made from the conch shell, and the black or purple wampum, or "suckanhock," from the hard-shell clam. The black was worth twice as much as the white. The beads were made by breaking the shells, rubbing the pieces smooth on a stone, and drilling holes in them so they could be strung. The French, Dutch, and New England settlers made use of them, from four to six beads being worth a penny. A string was called a fathom, and was worth from five to ten shillings. A string of wampum was given with every article of a treaty, and a belt of wampum to bind the whole transaction. The belts were embroidered with colored beads, which formed a record of the event.

Wan'amaker, John, an American merchant, ex-postmaster-general of the United States (1889–93), and man of affairs, was born at Philadelphia, Pa., July 11, 1838, and was educated in the public schools of that city. In 1861, after removing for a time to Indiana, he set up in business for himself in his native city; and in 1876, after turning his establishment into a colossal department store, with a separate house in New York city, he became the head of the firm — one of the largest concerns in the United States. In the conduct of these establishments, he introduced the profit-sharing system among his employees, to their great pecuniary advantage; while his philanthropies manifested themselves in other directions, especially in the founding of Bethany Presbyterian church and its organizations at Philadelphia, and presiding over the Young Men's Christian association in that city. He also showed his great organizing and executive ability in the office of postmaster-general of the United States, to which he was appointed in 1898 by President Benjamin Harrison. During the Civil war, he was one of the founders of the "Christian Commission." In politics, he is an independent Republican, and an opponent of the "machine."

Wan'dering Jew, the name given to the hero of a popular legend. In one story he belonged to the tribe of Naphtali and went with the three wise men from the east to Bethlehem, and his stories of the adoration of the infant were the cause of Herod's slaying the children of that region. As a carpenter, he was making the cross for Christ, when He passed on His way to Calvary, and refused Him rest. Christ bade him wander through the earth, without rest, till His second coming, which he has done ever since, seeking death in vain — so runs the legend. In another form of the story, he was a shoemaker at his bench, whereon he refused the Saviour permission to rest. The legend appeared first in the chronicle of Matthew of Paris, and many poems and novels have been based on it, notably *The Wandering Jew*, by Eugene Sue. It has also been the subject of illustrations, among the finest being those by Gustave Doré.

Warb'ler, the name for any one of a family of small abundant birds. There are two distinct families, the Old World and the New World warblers. The latter are the ones especially referred to here. There are about 100 species, all American. Many of them are less than five inches long, and nearly all are less than six and one-half inches. They show great variation in colors and are difficult to identify. About thirty-five species regularly visit the northeastern states, but very few are familiar to the casual observer for the reason that they perch mostly in the tree tops, and must be especially looked for. They are all insect-eating and migratory, May and September being the months in which they are most abundant in the eastern United States, some arriving and others passing on their way north or south. The yellow warbler is a summer resident and is abundant in lawns, parks, and orchards, but the others mostly inhabit woods. The redstart is also very abundant. It is a pert little bird, with red and black colors and a white belly. The black and white warbler nests in the eastern states. It runs over the bark of trees like a nuthatch. The black-throated, green warbler nests in pine woods from southern New England northward. Besides the tree-inhabiting warblers are a number which live in undergrowth and on the ground. Among these are the oven bird and Maryland yellow throat. The former makes an oven-shaped nest of grass on the ground. It is one of the larger warblers, being about 6.15 inches long. The yellow-breasted chat is the largest of warblers, reaching a length of 7.45 inches. It is one of the few birds which sing regularly at night. The Old World warblers are not represented in America. The tailor bird (which see), is an example.

Ward, Ar'temas, an American general, was born at Shrewsbury, Mass., Nov. 27, 1727. He was a graduate of Harvard college. He served in the French and Indian war and was sent as delegate to the provincial congress in 1774. He was commander of the Massachusetts troops at the beginning of the Revolutionary war and was head of the army

until the appointment of Washington, when he was made second in command. He was placed first on the list of major-generals by congress. He was sixteen years in the Massachusetts legislature and a member of congress for four years. He died at Shrewsbury, Mass., Oct. 28, 1800.

"Ward, Ar'temus" (Charles Farrar Browne), the "nom de plume" or pen name of an American humorist, was born at Waterford, Me., April 26, 1834. He began life as a printer, then acted as a reporter for a weekly paper in Cincinnati. His first letter signed with the famous name "Artemus Ward" pretended to be from a traveling showman and was published in a Cincinnati paper. He edited a humorous paper, *Vanity Fair*, in New York, gave humorous lectures, and brought out *Artemus Ward: His Book*. He published three other volumes of the same nature, which were all successful in their line. His last years were spent in England, where he was a contributor to *Punch*. He died at Southampton, England, March 6, 1867.

Ward, John Quincy Adams, an American sculptor, was born at Urbana, O., June 29, 1830. His first work was done in Washington, and consisted largely of busts of noted men, as Alexander Stephens, Hamlin, etc. Since 1861, his home has been in New York. His *Indian Hunter*, *A Private of the Seventh Regiment*, and *Shakespeare* are in Central park, New York; his colossal statue of Washington is on the steps of the subtreasury building in Wall street, New York, and a statue of Henry Ward Beecher in Brooklyn, and that of William E. Dodge on Broadway, New York. The *Good Samaritan*, *The Freedman*, statues of *Commodore Perry*, *Washington*, and *General Thomas*, are others of his well-known works.

Ward, Mary Augusta Arnold (Mrs. Humphry Ward), English novelist, who has achieved a world-wide fame, was born in 1851 at Hobart, Tasmania, where her father, Thomas Arnold, M. A., son of Dr. Thomas Arnold, of Rugby, and brother of Matthew Arnold, held an educational appointment. "Like George Eliot, Mrs. Humphry Ward's contact with literature and life has been broad and fruitful." Her ability and scholarship were shown early in her literary career by her contributions to *Macmillan's Magazine*, by her articles in Sir Wm. Smith's *Dictionary of Christian Biography*, and by her translation of Amiel's *Journal Intime*. Her first venture in fiction was a tale of an actress's life—*Miss Bretherton* (1884). Four years later, appeared *Robert Elsmere*, a remarkable though rather skeptical production, dealing with the struggle of an aspiring soul toward a newer theistic faith and creed. In 1892, came from her gifted pen *The History of David Grieve*, and two years subsequently appeared *Marcella*, the latter a noble study of woman nature. Her other writings embrace *Sir George Tressady*, a sort of art sequel to *Marcella;* and *Helbeck of Bannisdale*, two works of remarkable power and compelling interest. Mrs. Ward is intimately associated with the social and educational work of University hall, an institution in London, now merged in the "Passmore Edwards' settlement."

MRS. HUMPHRY WARD.

Waring (*wā'ring*), **George Edwin,** American sanitary engineer, was born at Poundridge, N. Y., July 4, 1833, and died in New York city, Oct. 30, 1898. He was educated at Poughkeepsie, studied agriculture, and lectured on it in Maine and Vermont. From 1857 to 1861 he was drainage engineer of Central park, New York; and on the outbreak of the Civil war he became major of the Garibaldi guard, after which he raised and became major of the Fremont hussars, and subsequently colonel of the 4th Missouri cavalry. In 1880, he became special agent of the United States 10th census and later member of the national board of health. His knowledge of drainage problems made him very useful to the authorities of New York city and led to his being consulted by those of other towns and cities. After the yellow fever epidemic of 1878 in Memphis, he devised the sewage system of that city, and from 1895 to 1898 he was commissioner of street cleaning in New York, doing wonders as administrative head of the department. In October, 1898, he was appointed head of a commission to improve the sanitary condition of Havana and other Cuban towns, and to select the sites of camps for the American troops. His published works embrace *Draining for Profit and Draining for Health*, *How to Drain a House*, *Sewerage and Land Drainage*, and *Sanitary Drainage of Houses and Farms*.

Warm'ing and Ventila'tion are so connected as to be best treated in one article. In one sense they are opposed to each other, as the necessity of ventilation or pure air requires frequent changes of the air, which thus carries off the heated air of a room, and requires more heat to replace it. The human body must be kept at a temperature of 98° for healthy living, which is secured partly by food, which supplies heat, and by clothing to retain the heat, but largely by artificial heat in houses. Pure air to breathe is also a necessity. The air we breathe contains oxygen and a small part of carbonic acid, which in large quantities is a poison. In breathing,

the oxygen is taken from the air and carbonic acid is added to it, so that without a fresh supply the air of a room becomes in a short time so full of carbonic acid as to be poisonous. In warming and lighting a room, the same process goes on—the oxygen is taken from the air and carbonic acid gas is given out. A person uses up the oxygen in four cubic feet of air every hour, and makes impure with carbonic acid one cubic foot of air every minute. A large oil lamp will make impure 70 cubic feet of air an hour; a pound of coal in burning will use up 120 cubic feet of air, and a cubic foot of gas will rob ten feet of air of oxygen. Besides heating the fresh air let into a room for ventilation, the warming apparatus has to overcome the loss of heat through glass windows, walls, floors, and ceilings.

The methods of warming and ventilating a room are numerous. The open fire, stoves, and furnaces, supplying hot air, hot water, or steam, are all in use and all have their advocates. The open fire gives the best ventilation, but is wasteful of coal and unequal in its heat. The close stove is economical of fuel and heats a room quickly, but burns the air, making it too dry for health. The use of furnaces is becoming quite general, especially for large buildings, as they heat every part of the house, and at much less expense than would be necessary to heat the same space with stoves or grates. They burn the air, however, rendering it too dry, and need careful management. In order to prevent the escape of heat double walls, double windows, well-fitting doors, etc., are used, but the more successful these contrivances are, the less fresh air enters and the more need of artificial ventilation. If houses were perfectly built the inmates would suffocate. Two things are necessary in ventilation, to remove foul air and bring in pure air. As hot air rises, an open chimney in which the air is heated and drawn up, the cold air from the cracks and crevices taking its place, is always a ventilator, and in ordinary rooms, as houses are usually built, a sufficient one. Other methods in use are ventilating shafts, with openings at top or bottom or both, for the removal of the impure air and the introduction of fresh air; the heating of currents of fresh air introduced into stoves or furnaces and then distributed; and in large buildings pumping engines to force fresh air through pipes into all the rooms. The whole subject of warming and ventilation, however, is still a problem to builders.

War'ner, Susan, an American author, was born at New York city in 1819. Her stories for girls have been very popular, especially the *Wide, Wide World*, which has had the largest circulation of any American novel, except *Uncle Tom's Cabin*. Other writings are *Queechy*, *The Hills of the Shatemuc*, *The Old Helmet*, *Ellen Montgomery's Book Shelf*, etc. She is best known by her pen name, "Elizabeth Wetherell"; she died at Highland Falls, N. Y., March 17, 1885.

War'ner, Charles Dudley, an American writer, was born at Plainfield, Mass., Sept. 12, 1829. He was a graduate of Hamilton college, practiced surveying in Missouri, studied law in the University of Pennsylvania, and practiced in Chicago until 1860. He was editor of the *Press* and *Courant* at Hartford, Conn., and of a department in *Harper's Magazine*. Among his writings are *My Winter on the Nile*, *A Roundabout Journey*, *Mummies and Moslems*, *Their Pilgrimage*, *My Summer in a Garden*, *Baddeck and that Sort of Thing*, and *Backlog Studies*. He died Oct. 19, 1900.

CHARLES DUDLEY WARNER.

War'ren, Joseph, an American patriot, was born at Roxbury, Mass., June 11, 1741. He graduated at Harvard college, and began the practice of medicine at Boston. He twice delivered an address on anniversaries of the Boston massacre. In 1774, he was president of the Massachusetts congress, and was made by it a major-general. At the battle of Bunker Hill he appeared unattended, and declining to take the command which was offered him, fought as a volunteer. As he was leaving the field, being one of the last to retire, his name was called by a British officer, who commanding his men to stop firing, urged Warren to surrender. But as he turned his head at the sound of a voice, he was instantly killed by a ball striking him in the forehead, June 17, 1775. His statue at Bunker Hill was unveiled June 17, 1857. See *Life*, by Frothingham, and by Everett, in Spark's "American Biography."

War'ren, Samuel, an English novelist, was born in Wales in 1807, and died at London, July 29, 1877. He was a lawyer and edited an edition of Blackstone's *Commentaries;* but is best known by his novels, which appeared in *Blackwood's Magazine*, entitled *Ten Thousand a Year*, and *Passages from the Diary of a Late Physician.*

War'saw, the former capital of Poland, and the third city of the Russian empire, is on the Vistula river, about 395 miles east of Berlin. It stands partly on a plain and partly on rising ground, and is connected with one of its beautiful suburbs by two fine bridges. There are about 160 palaces in Warsaw, and 180 churches, among them the Cathedral of

St. John, which dates from 1250; several theatres, one of them in a garden laid out in the old bed of the Vistula; fine squares, and public gardens, with monuments to Sobieski, Copernicus, etc. The university, founded in 1816, and closed by the Russians in 1832, was opened again in 1864. It has a library of 350,000 volumes, a fine observatory, and 1,114 students. The leading industries of the place are plated silverware, musical instruments, carpets, boots and shoes, carriages, woolen cloth, and beer. Warsaw is first mentioned in history in 1224. It belonged to the dukes of Mazovia until 1526, when the land of the Mazurs was annexed to Poland. It was fought over continually by the Swedes, Russians, Brandenburgers, and Austrians. In 1795, it was given to Prussia; in 1806, Napoleon's troops occupied it; in 1809, the Austrians, and the Russians finally obtained possession in 1813. Two unsuccessful rebellions against Russia occurred, one in 1834, and the last in 1863. The Russian government, determined to crush out utterly the spirit of independence, took severe measures, executing or banishing to Siberia the nobles and clergy, and confiscating their property, carrying off in large bodies the tradesmen, closing the university, schools, monasteries, and convents, and placing Russian officials in all places of power. The use of the Russian language was commanded, and even the name Poland was cut out of all legal documents. Population 638,209.

Wart'burg, an old German castle, near Eisenach, in Saxe-Weimar. The Wartburg war is the name given to a contest of the principal Minnesingers of Germany, which was held at the castle about 1206. The castle is also the scene of the legend of St. Elizabeth of Hungary, who was the wife of one of the landgraves of Thuringia, to whom it belongs. It is best known, however, as the place where Luther was hid after the Diet of Worms, and where he translated the Bible into German. In 1817, the German students celebrated here the three hundredth anniversary of the Reformation. The castle was built in 1070.

War'wick, Richard Neville, Earl of, called the king-maker, was born about 1420. He was a son of the earl of Salisbury, but through his wife obtained the estates and title of earl of Warwick. In the Wars of the Roses, he sided with the duke of York, and won for him the battle of St. Albans, receiving in recompense the governorship of Calais, and command of the English fleet for five years. At the battle of Towton, near York, the followers of Lancaster were gaining ground, when Warwick, riding up to Edward, duke of York, and getting down from his horse, which he shot in the head as a signal for an attack without retreat, said, "Sire, let him flee who will, but by this cross, I will stand by him who will stand by me." The York party won, and Edward was crowned king in London, June 22, 1461. Edward's marriage with Elizabeth Woodville, and that of his brother Clarence to Warwick's daughter, made a breach between the two, which ended in the battle of Edgecote, where Edward was made a prisoner. After a partial reconciliation and another insurrection, Warwick openly deserted to the Lancaster party under Queen Margaret, his son-in-law Clarence being promised the succession to the throne. Edward IV. fled to Holland, and the imprisoned monarch Henry VI. was restored, but only for a few months. Edward returned, with an army of 2,000 Englishmen; Clarence deserted Warwick and came to his aid; Henry was again sent to the Tower; and at the battle of Barnet, Warwick's forces were defeated and Warwick was slain, April 14, 1471. He lived royally, owning 100 manors, the city of Worcester, and the islands of Guernsey, Jersey, Alderney, and Sark. At his house in London six oxen were usually eaten at a breakfast, and he daily fed 30,000 guests. He is called "the Last of the Barons." See *Baronage of England*, by Dugdale; *History of England*, by Lingard.

Wash'burne, Elihu Benjamin, an American statesman, was born at Livermore, Me., in 1816. He studied law and began his practice at Galena, Ill., in 1840. He was in congress from 1852 to 1869, and was called the "Father of the House" for his long service. He was minister to France during the Franco-Prussian war, and at the request of Germany very skillfully protected Germans who were residing in France at the time. He wrote *Recollections of a Minister to France*. He belonged to a family of statesmen, two of his brothers being in congress with him, and the governors of Wisconsin and Maine, and another brother was United States minister at Paraguay. Elihu Washburne died at Chicago, where he spent the last years of his life, Oct. 22, 1887.

Wash'ington, a city in Pennsylvania, thirty miles southwest of Pittsburg. It has several factories, including iron foundries, woolen and carriage factories, and is the seat of Washington and Jefferson college. The college was formed in 1865, by the union of Washington college, which as an academy dated back to 1787, and Jefferson college, which grew out of the Canonsburg academy, opened in 1791. Population 7,063.

Wash'ington, the capital of the United States, is situated in the District of Columbia on the Potomac river, thirty-nine miles southwest of Baltimore. The city was laid out under the direction of Washington, on a plain forty feet above the river, with wide streets and twenty-one broad avenues, named after the states. Three streets, known as North, South, and East Capitol streets, radiate from the Capitol, and with a line of public parks divide the city into four quarters.

The avenues run diagonally, and where they cross circles are formed, with triangles at their intersection with the streets, and besides these ornamental spaces there are a number of squares with trees, shrubbery, fountains, and statues. Pennsylvania avenue is the main street of the city, and Massachusetts avenue the finest.

The chief public building is the Capitol, of which the corner stone was laid by Washington in 1793, and the structure finished in 1827. An extension of two wings was finished in 1867. The building covers about 3¼ acres, and is 751 feet long and 348 feet broad. The dome, 287½ feet high, is crowned by a bronze statue of Liberty. The rotunda under the dome, senate chamber, hall for the house of representatives, and one for the supreme court, are some of the interior rooms. The White House, the residence of the President of the United States, is a mile and a half from the capitol. It was first used by President Adams in 1800. The other public buildings are the treasury, state, war,

THE CAPITOL, WASHINGTON.

navy, interior, and post office departments, pension building, Smithsonian institute, observatory, arsenal, and the new congressional library building, in modified Italian renaissance style, which has a capacity for 4,500,000 volumes, and is one of the finest of all the capital buildings. The National Deaf-Mute college, the only one in the world, Howard university, Columbian university, and the Catholic university, are among the educational institutions. The government hospital for the insane, naval hospital, soldiers' home, and Columbian institution for the deaf and dumb, are a part of its charities. The Corcoran art gallery contains one of the finest collections in America. The Washington monument, 555 feet above the foundations, the highest in the world; the Lafayette monument, naval monument, Abraham Lincoln with the proclamation of emancipation, a statue of Jackson, made from the cannon captured at New Orleans, and one of Scott, from cannon taken in the Mexican war; of Washington, Garfield, Greene, Marshall, Dupont, Farragut, Franklin, and Luther, are some of the best known of the monuments of the city. The site of Washington was selected by General Washington in 1791, and congress met there for the first time Nov. 17, 1800. In 1814, it was occupied by the British and the public buildings burned. Though several times threatened during the Civil war, it was never attacked. Since 1871, the city has been improved at great expense, making it now one of the most beautiful cities in the world. Population 278,718. See DISTRICT OF COLUMBIA.

Wash'ington, the most northwestern state of the Union, stretches from Idaho to the Pacific ocean, and from British Columbia to Oregon. It is 350 miles wide and 250 miles long, with an area of 66,880 square miles. The eastern and the western parts of the state are quite different, the western part being mountainous, with its coast deeply indented, while the eastern division is more level, with good grazing land. The Cascade mountains cross the state from north to south, and the Coast range follows the Pacific coast. Mt. Tacoma, one of the highest peaks in America, Mt. St. Helen's, and Mt. Baker, both volcanoes, are the highest mountains. Puget sound on the western coast of the state, one of the most beautiful sheets of salt water in the world, is an arm of the sea joining the gulf of Georgia and strait of Juan de Fuca, stretching about 100 miles into the heart of the country, with bays, coves, inlets, and channels, forming a collection of magnificent harbors. The Columbia river, flowing across the state, part of the way through cañons 2,000 feet deep, forms in its lower course part of the boundary between Washington and Oregon. Clarke's Fork and Spokane, Yakima, and Snake rivers are the most important branches of the Columbia. There are mountainous islands used as fruit farms and sheep pastures, scores of beautiful lakes, and many mineral springs. The climate is mild in winter and cool in summer, the Chinook wind from the Pacific ocean moderating the cold winds from the north. Grass is green the whole year, and flowers often blossom in mid-winter. Western Washington is densely wooded, and its streams and lakes abound in fish, and whales and seals are found on the coasts. The principal crops are wheat, barley, oats, hops, and fruits. Gold, silver, iron, and coal are the minerals of the country, which have only begun to be developed. The most important industries of the country are the lumber trade and the fisheries, especially of salmon and oysters.

In 1898, the state expended $1,815,662 for school purposes. There were about 1,900 school buildings, the elementary departments having 3,211 teachers and 94,928 pupils, and the high schools having a force of 110 teachers and an attendance of 2,988 students. There are eight universities and colleges, among them the state university, with a

grant from congress of two townships of land, opened in 1862 at Seattle, with five departments, the Agricultural college and School of Science being located at Pullman; Whitman college, at Walla Walla, dating from 1866; and Puget Sound university, at Tacoma. The coast of Washington was first explored by Americans in 1789, when some Boston merchants sent out the *Columbia* and the *Lady Washington*, to trade with the Indians for furs. The party ascended the river, which they named after their ship, *Columbia*. Great Britain obtained from Spain, who claimed the coasts, a treaty allowing the English to trade there, and in 1791 Vancouver took possession of a large part of the country in the name of England, and in 1805 Lewis and Clarke descended the Columbia river and spent the winter on the coast. In 1846, England yielded her claims to the region to the United States. The first settlement was made at Turnwater in 1845. The territory was organized in 1853 and became a state in 1889. Capital, Olympia. Population 518,103.

Wash'ington and Lee Univer'sity, located at Lexington, Va., was chartered in 1782 as Liberty Hall academy. The first important gift of property to the school was made by George Washington in 1796. In recognition of this benefaction the name of the school was changed to Washington academy, which later became Washington college. At the close of the Civil war, Gen. Robert E. Lee was elected president of the college, and was installed Oct. 2, 1865. This position he held until his death, Oct. 12, 1870. In 1871, the general assembly of Virginia changed the name of the institution to Washington and Lee university. It now has a faculty of 22, with 222 students in attendance.

Wash'ington, Booker T., principal of the Tuskegee Normal and Industrial institute, Tuskegee, Ala., was born in Franklin county, Va., about the year 1859. Born a slave, he has become prominent as a speaker and writer on racial and on educational topics. Early in life he worked in salt mines in Malden, W. Va., but managed to make his way to the Hampton institute, Virginia, where he received an education. In 1881, he was called to the Tuskegee institute, founded by him in the interests of the colored race, which he seeks to elevate by means not only of religious instruction, but by an academic training, coupled with courses in manual and industrial work of a useful and practical character. Over 1,000 students annually attend the institute and find their way afterward into industrial occupations. The institution is non-denominational and one for both sexes, the founder's idea being to enable his colored brethren to meet present-day conditions, social and industrial, in the south, and to do that by suitable education and moral training in the students he turns out from his seminary.

Wash'ington, George, the first President of the United States, was born in Westmoreland county, Va., Feb. 22, 1732. At the age of sixteen he was made surveyor of the large Fairfax property in Virginia, through his brother Lawrence, who had married into the Fairfax family. In this work he camped out in the forests for months and was in constant danger from Indians. When the French and Indian war broke out, he was sent by Governor Dinwiddie, of Virginia, to warn off the French, and his vigorous defense of Fort Necessity gained him when only twenty-three the post of commander-in-chief of all the Virginia forces. He served in Braddock's campaign, and at Fort Duquesne, though he had two horses shot under him and four bullets through his coat, he was one of the few officers not wounded, and the Indians believed him to lead a charmed life. With the close of the war, he married Mrs. Martha Custis, a wealthy widow, and settled down at Mount Vernon, which had been left him by his brother, Lawrence. Here he lived for twenty years the life of a southern planter, cultivating his estate and owning a large number of slaves, who were emancipated at the death of his wife by his will. He was several times a member of the Virginia legislature, where Patrick Henry called him, "for solid information and sound judgment, the greatest man in the assembly"; and in 1774 was sent to the continental congress. After the battles of Lexington and Concord, congress, on motion of John Adams, unanimously selected George Washington as commander-in-chief of the army. Refusing any salary, he accepted the position, asking every gentleman in the room to remember his declaration that he did not consider himself equal to the command; a humility that went with him in all the high places to which he was called. He hastened to the camp at Cambridge, Mass., where he assumed the command, July 2, 1775. His courage, prudence, firmness, and perseverance through defeats, jealousies, disaffection, and lack of men and supplies, never failed, and brought the war to a successful issue in 1783. His influence secured the quiet disbanding of the discontented army, and he himself retired to his home on the Potomac. When the convention met in Philadelphia, in 1788, to frame the constitution, he was its presiding officer, and approved the constitution, and when the time came under its provisions to elect the first President, there was only one choice in the country and Washington was made first President of the United States by the unanimous vote of the electors in 1788, was unani-

GEO. WASHINGTON.

mously re-elected in 1792, and declined an election in 1796. His prudence and firmness and good judgment were as much needed in the forming days of the young republic as they had been in its struggles for liberty, and gradually with the help of his wisely selected cabinet the many difficult problems of the new government were settled. He made his farewell address Sept. 17, 1796, and retired to Mount Vernon. Within a short time, however, difficulties with France threatening war, Washington was again called to the command of the armies of the United States. In the midst of these military preparations, he died, after a short illness, Dec. 14, 1799. In the resolutions adopted in congress at his death, moved by John Marshall, occurs the well-known expression, "First in war, first in peace, and first in the hearts of his countrymen." He was six feet two inches in height. with a large frame, brown hair, and blue eyes, and was very dignified and self-controlled, He had no children, but adopted two grandchildren of his wife. See *Life*, by Irving; *Critical History of the United States*, by Winsor, etc.

Wasp (*wŏsp*), any one of a considerable group of insects, forming, with bees and ants, the highest order of insects (Hymenoptera). These well-known insects show some variation in form, sometimes the thorax and abdomen are connected by a slender thread; in other forms these parts of the body merge into one another. The social wasps, like the hornet, or yellow jacket, are the best known. They build nests of paper attached to bushes, trees, roofs, and eaves of buildings. The paper is manufactured from wood fiber obtained from posts and unpainted boards. This is chewed in the jaws and united into sheets, often of considerable extent. The nests are often top-shaped or balloon-shaped, with layers of cells inside resembling honeycomb, all inclosed in a spherical paper envelop with a hole at the bottom for entrance and exit. These nests in tropical countries are sometimes six feet long. Other species of social wasps make nests in the ground, forming a more fragile sort of paper from decayed wood. The colonies include three forms, males, females, and workers. The males and workers die on the arrival of cold weather, but the females live over the winter in sheltered places, and start a new colony in the spring. The workers only have stings. The solitary wasps form another division of these insects which include miners, mud-daubers, and carpenters. The mason wasps, or mud-daubers, are the most familiar, as their mud nests are commonly seen on beams and walls. The carpenters cut tubular nests in wood and divide them by mud partitions. The miners dig tunnels in the earth. Wasps are endowed with a considerable degree of intelligence. See Lubbock's *Ants, Bees, and Wasps* (1881).

Watch. See CLOCK.

Wa'ter is a clear, transparent liquid, formed of oxygen and hydrogen. It is almost colorless, though in large masses it looks blue. It freezes at 32° and boils at 212° and passes off in steam. Water dissolves almost everything it comes in contact with, so that strictly pure water is never found. Rain water is the purest form, but even that has absorbed air and ammonia. Water is found very widely distributed in nature in the form of ice and snow, in watery vapor in the air, in lakes, rivers, and seas, in the soil and rocks, and in the sap and juices of plants and in the blood and flesh of animals. It covers three-fourths of the surface of the earth, and forms a large part of the bodies of animals. The ocean is Nature's great reservoir (or cistern), and from it all other water may be said to be taken. A constant stream of vapor passes into the atmosphere, and is condensed in colder regions, returning to the earth in the form of rain, dew, frost, and snow, which fertilize the earth, and are collected into pools, springs, lakes, and rivers, and finally find their way back to the ocean. These waters all take up various substances, as is seen by the color of different rivers, which varies as the soil through which they pass. The water of the ocean is salt, but the saline (salty) matter does not form a vapor, and so is left behind when the watery vapor rises from its surface. Besides its use in watering the earth, feeding animal and vegetable life, water has been the great agent in forming the surface of the earth. A river carries with it a large amount of earthy matter, of which it has robbed the hills in which it springs, and deposits it in the valleys through which it flows; the great bars and deltas at the mouths of rivers being examples of the amount of land sometimes formed by the sediment in a river. This double process of breaking down and dissolving the rocks, and depositing and building up the land is constantly going on, and has been going on for ages. Geology gives the results of this constant action of water in past ages, as seen in the strata or layers of rocks, which form the earth. In the form of ice or glaciers it has also had a large part to play in forming the continents. Some of the many purposes it serves are its use in supplying a motive power to machinery, either mechanically, as in waterfalls, or by its expansion into steam, its use in cleansing and cooking or domestic purposes, its use in the laboratory as a solvent or dissolver of most substances, its universal use by men, animals, and plants, for drinking purposes. See ICE, GLACIERS, WATER WORKS, WATERFALL, OCEAN, SEA, etc.

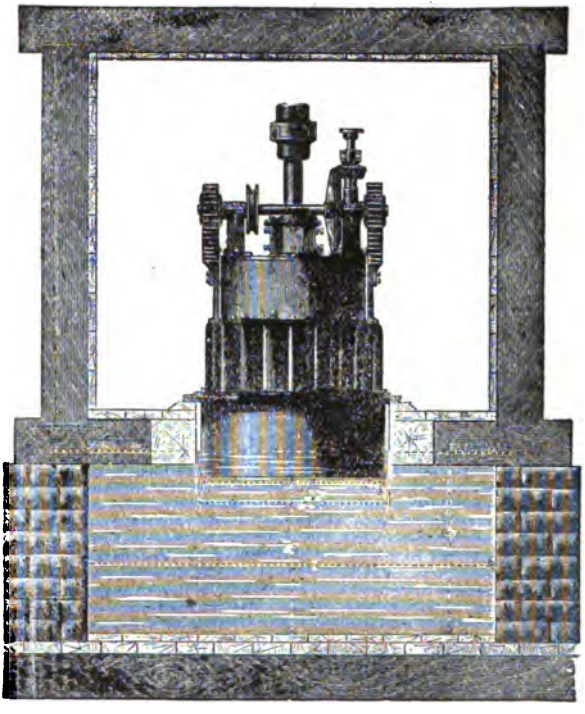
Wa'ter, Ascent of (in plants). Water to supply the evaporation (see TRANSPIRATION) from the larger land plants enters by the roots, especially the root-hairs, and passes thence into the woody strands which lie in the

center of the root. These connect with similar strands in the stem, which run out into the leaves and branch profusely, following the so-called veins and constituting the veinlets. The water travels chiefly in the interior of the minute elongated tubes (ducts or vessels) which make up the greater part of these strands (see VASCULAR BUNDLES). These ducts are not continuous tubes, however, so that the water has to traverse the partition walls which occur here and there (abundantly in pines and their kin). The water is not forced up from below by the roots, except in low plants and at some seasons (see ROOT PRESSURE); it certainly does not rise by capillarity. No satisfactory understanding of the forces concerned has yet been reached, though the problem has been attacked by many investigators.

Wa'ter Bug, the name for a number of water insects inhabiting the streams and ponds of the United States. They belong to the order of true bugs, that is, they have the mouth parts in the form of a sharp stylet or beak for sucking. The water boatman is one form, swimming on its back. The water stick is a long, slim water bug. The water scorpion, also sometimes called the electric light bug, is the most formidable of them all. It is about two inches long, with sharp, pointed forelegs with which it catches small fishes and frogs and sucks their blood. It flies from pond to pond at night, and is attracted by strong lights. See ELECTRIC LIGHT BUG.

Wa'ter Lily, a general name applied to all members of the family *Nymphæaceæ*. They are aquatic herbs, native to all temperate and tropical regions. The stems are submerged, and the broad leaf-blades ("lily-pads"), on long petioles, float on the surface of the water. The true water lilies are a species of Nymphæa or Castalia, the flowers being showy and of various colors. In the common species the petals are numerous and beautifully white and fragrant. The yellow pond-lily or spatter-dock is a species of Nuphar.

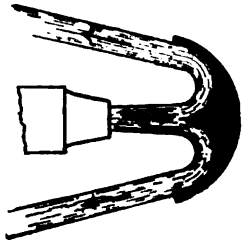
Wa'ter Wheel, a wheel arranged so as to transform water-power into rotary mechanical power. The work done is due to the force of gravity on the water and the possible work is equal to the fall multiplied by the weight of the water. To get the maximum work it is necessary that the water shall enter without shock and leave the wheel without further fall and velocity, conditions which can, of course, only be approximated. But water wheels give efficiencies which rival that of other prime motors. Efficiencies of over 90 per cent. have been reached, while efficiencies 75 to 85 per cent. are commonly attained in the best wheels. Water wheels have been used from a very remote period in human history. Up to about 1825, practically all wheels used were of three types, overshot, undershot, and breast wheels. These were wheels revolving on horizontal axes. They had buckets or paddles on the circumference. As the name implies, the water fell from above into the buckets of the overshot wheel, while in the case of the breast wheel the height of the water was about that of the axis of the wheel, and in the undershot wheel, the water flowed below and moved the wheel by impact against the blades. The overshot and breast wheels commonly reached efficiencies of from 75 to 80 per cent., while the efficiency of the undershot wheel was much less. The above wheels are seldom used now, except in small powers and in old mills. The two kinds of wheels used to-day are turbine wheels and impact wheels of the Pelton type. The turbine wheel was introduced into France by Fourneyron about 1827, and from there soon afterward into England and the United States



TURBINE WHEEL.

by Fairbain and by Boyden. The peculiarity of the turbine is that the water flows between curved channels, so that it impinges on the vanes or buckets of the turbine tangentially, and thus by a reaction force rotates the

turbine. The vanes of a turbine are commonly warped surfaces, shaped for local conditions and according to the special ideas and experience of the designer. The older turbines revolved about a vertical axis, but many modern turbines have horizontal axes. There are three methods by which the water has been led into the wheel, from the center outward, from the rim inward, and from above downward through the wheel. Turbines are smaller and have a higher rotation speed than older kinds of wheels. They run with greater regularity and their efficiency is equal to, if not greater, than most of the older wheels. An efficiency of from 85 to 90 per cent. is common. The most powerful turbines ever built are those for the Niagara Falls Electric plant. There are ten of these, each with a capacity of 5,000 H. P. The water has a mean head of 136 feet and is led through a steel penstock 7½ feet in diameter. The wheels are 63 inches in diameter and make 250 revolutions per minute. The shafts of the turbines carry directly the revolving parts of the generators for this great plant. Since about 1880 a special form of water wheel, called the impact wheel, has been developed and introduced in California. The Pelton water wheel is the best known of the impact wheels. It is used where the head is very great. A jet of water is led against the steel buckets on the edge of the wheel and these are shaped so as to throw the water off to the side. Pelton wheels are used in practically all the long distance electrical transmission lines in California where the head is high. In the Fresno plant the water head is 1,400 feet, and the Pelton wheels have an output of 1,000 H. P. The use of water-power in the world has been increased by the development of long-distance power transmission by electricity. It is estimated that 5,000,000 H. P. in water-power can be made available in the United States by electric transmission, and a recent writer in the *Engineering Magazine* places the water-power of Italy that can be made available by electric transmission as over 1,000,000 H. P. The use of water wheels is thus likely to increase. A. P. CARMAN.



NOZZLE AND BUCKET OF PELTON WATER WHEEL.

Wa'ter Works, a system of pipes and conduits connected with reservoirs or pumping stations for the supply of water to communities. The ordinary supply of water to communities where the population is scattered is from shallow wells, but in crowded cities such wells become very dangerous on account of the contamination of the water by impurities from the soil. The water supply of large cities is often a very difficult problem, and large reservoirs and long conduits often have to be built to get an ample supply of pure water. The common sources of supply are streams, lakes, springs, and wells. If the water is derived from streams or lakes, the great difficulty is to get a drainage area which has not been rendered impure by the refuse of the surrounding population. The water of New York city is derived from the water shed of the Croton river and is led into reservoirs in New York city through an aqueduct 29.6 miles long. This aqueduct has an average diameter of over 13 feet. (See *Century Magazine* for December, 1889). Chicago and Cleveland pump their water from the neighboring lakes, a tunnel of several miles being bored out under the lakes in each case so as to secure water free from shore refuse. Where the water for public supply is taken from wells, the wells are always sunk or driven several hundred feet into the lower strata, where the supply is both more constant and also freed from surface impurities. Two systems of distribution are in use, the reservoir and the pumping system. In the reservoir system, the water is collected by natural flow or by pumping into reservoirs and then distributed by gravity to the houses. In the direct pumping system the water is pumped into the mains by pumps which are kept working day and night. The latter system is cheaper to install, but more expensive to operate. Where there is no natural elevation for a reservoir, it is common to erect a large steel stand pipe, which will have sufficient capacity to furnish part of a day's supply. The daily consumption of water in American cities is about 100 gallons per person. This is from two to three times the amount used in European cities. To check the waste of water, it is common now to supply water by meter, so that each user pays according to the amount consumed by himself.

Wa'terbury, a city in Connecticut, thirty-three miles southwest of Hartford. It is on the Naugatuck river and surrounded by hills. It has a fine public park, a free library, and other public buildings. It is known as the center of the brass manufacturing business of the United States, which began in 1802 with the making of gilt buttons. Electric wire, student lamps, hinges, match safes, clocks, watches, pins, hooks and eyes, and percussion caps are made by the million. Waterbury was settled in 1667. Population 45,859.

Wa'terfall or **Cat'aract,** a break in the slope of the bed of a river so abrupt that the water falls from the higher to the lower level. They usually occur in mountainous regions, where the streams flow from the mountain sides into valleys. The channel of the river must be rocky to form a fall, as the quantity of water would otherwise soon wear out a side channel. Some of the finest waterfalls are the Orco falls, at Monte Rosa, 2,400 feet; Staubbach falls in Switzerland, 1,000 feet;

Zambesi falls in Africa, 360 feet; Niagara falls, 163 feet; and among the most wonderful in the world for their great width and the enormous volume of water which pours over them, are the falls of the Yosemite, in California, 2,526 feet, the highest in the world.

Wa'terloo, a village in Belgium, nine and a half miles southeast of Brussels, which owes its fame to the great battle fought in its neighborhood between Napoleon and Wellington, June 18, 1815. The French army numbered about 72,000 men, and Wellington's army numbered about 67,000, made up of British, German, and Dutch troops. Napoleon supposed he had only Wellington's army to fight, as the Prussians had retreated before Ney on the 16th. But their retreat was toward Waterloo, and their arrival on the battlefield on the afternoon of the 18th turned the battle against the French, who, finding themselves hemmed in between the British and Prussians, fled in disorder. The roads southward were crowded with fugitives fleeing from the pursuing cavalry. One regiment of the guard which had covered Napoleon's retreat was surrounded and ordered to surrender, but their general, making the well-known answer, "The guard dies; it does not surrender," charged upon the enemy, and perished almost to a man. The combined losses of this battle were about 50,000 men. Victor Hugo says the defeat of Napoleon was brought about by a rain the night before, which delayed the attack in the morning, thus giving the Prussian troops time to reach Waterloo; while others ascribe it to Grouchy's failure to obey orders. For a description of the battle, see *Les Miserables*, by Victor Hugo.

Wa'terloo, Ia., the capital of Black-Hawk county, on both banks of the Cedar river, which furnishes water-power for its industries, northeastern Iowa, 94 miles west of Dubuque, and 105 miles northeast of Des Moines. It is on the Burlington, Cedar Rapids, and Northern, the Illinois Central, and the Chicago and Great-Western railroads. It is the center of a productive agricultural country and the shipping point for large supplies of grain and produce. Besides the repair shops of the Illinois Central railroad, the city's industries include flour mills, foundries, carriage and machine shops, sash, door, and blind factories, agricultural implement works, etc. Population 12,580.

Wa'termel'on, the fruit of *Citrullus vulgaris*, a species of the gourd family, and native to Asia and Africa. Over sixty varieties have been produced and catalogued.

Wa'tertown, a city of New York, is on the Black river, ten miles from Lake Ontario. The river crosses the city and falls 112 feet in about two miles, thus giving fine water-power for the manufactures of the place. Flouring mills, paper mills, foundries, breweries, sewing machine works, and factories of paper flour sacks, boots and shoes, cigars, carriages, and sashes are the most important of its manufactures. It also has a large trade with the fine agricultural region in which it is situated. The city annually expends $87,687 on its public schools, which have a force of 114 teachers and an enrollment of 4,300 pupils. It was settled in 1800, and became a city in 1869. Population 21,696.

Wa'tertown, a city of Wisconsin, is on the Rock river, thirty-five miles northeast of Madison. It has a large trade and a number of manufactories, such as flouring mills, threshing machine works, brick factory, etc. It is the seat of the Northwestern university, a Lutheran institution founded in 1864, and of the Catholic University of the Sacred Heart, chartered in 1872. Population 8,437.

Wa'terville, a town of Maine, on the right bank of the Kennebec river, eighteen miles northeast of Augusta. The Ticonic Falls give it a fine water-power, around which are clustered the factories of shovel handles, boot shanks, sash and doors, shirts, furniture, etc. It is the seat of Colby university, a Baptist institution, which was first called Waterville college, becoming Colby university in 1867. It has several fine buildings and a library of 25,000 volumes. Population 9,477.

Watervliet (*wȧ'ter-vlēt*), **N. Y.** (formerly West Troy village, incorporated as a city since 1890), in Albany county, on the Hudson river, opposite Troy and a few miles north of Albany. Here, on a reservation, is Watervliet arsenal, with its ordnance-constructing plant, powder and ammunition magazines, etc., owned and operated by the national government. The Erie canal passes through the reservation, and the arsenal controls considerable wharfage on the Hudson. The town grows apace, and in civic institutions, as well as in residences, begins to assume the status of a city. Population 14,321.

Wat'son, John Crittenden, American naval officer (rear-admiral in command of the Asiatic station, with pennant on United States battleship *Oregon*), was born at Frankfort, Ky., Aug. 24, 1842, entered the United States Naval academy in 1856, and graduated in 1860. From 1862 to 1864, he acted as aide to Admiral Farragut on the *Hartford*, and took part in forcing the Mississippi river and capturing New Orleans; he was wounded at the battle of Mobile bay. From 1865 to 1867, he served on the *Colorado* in the European squadron, and was promoted to commander in 1874, to captain in 1887, and to commodore in 1897. In the war with Spain, he commanded the blockading squadron on the north Cuban coast on the *Newark*. In June, 1898, he was given command of a squadron designed to operate against the coasts of Spain, but the collapse of the war

rendered the project unnecessary. In June, 1898, he was appointed commander-in-chief of the eastern squadron.

Wat son, Rev. **John** (nom de plume "Ian Maclaren"), one of the most popular of the Scotch school of story writers, and a prominent figure in English religious life, was born of Scottish parents at Manningtree, Essex, Nov. 3, 1850, and educated at Edinburgh university, and at Tübingen. Ordained a minister of the Free church of Scotland, he had his first important charge at Free St. Matthew's, Glasgow, and afterward was transferred to the Sefton Park Presbyterian church, Liverpool. Till 1893, Dr. Watson was known as an able and popular preacher; but in that year he acquired greater distinction and a wider fame by a series of Scottish prose idylls, written for the *British Weekly*, and afterward published under the title of *Beside the Bonnie Brier Bush*. This work won deserved praise for the fidelity with which he has portrayed humble and reverent Scottish life and scenes. The volume was followed by *The Days of Auld Lang Syne*, *Kate Carnegie*, *A Doctor of the Old School*, and by *Rabbi Saunderson*, and *Afterwards, and Other Stories*. His religious writings embrace *The Upper Room*, *The Mind of the Master*, *The Cure of Souls*, *The Potter's Wheel*, and *Companions of the Sorrowful Way*. In 1896, and again in 1899, he visited the United States on lecturing tours, and delivered the Lyman Beecher lectures, at Yale university, on practical theology.

IAN MACLAREN.

Watt, James, a Scottish inventor, was born at Greenock, Scotland, Jan 19, 1736. He began as a maker of mathematical instruments, and eked out his living by mending fiddles. In 1767, he got employment as a civil engineer, making surveys for canals and for the improvement of harbors. He also invented a micrometer, an instrument for measuring distances. The work for which he is famous, however, is the improvement of the steam engine. Before his day, the steam engine was a slow-working, wasteful, cumbersome steam pump. His first patent made it quick and efficient, but still only a steam pump. His later inventions adapted it to driving machinery of all kinds and made it virtually the steam engine of to-day, except for a few late improvements. The business of making steam engines which he and his partner had built up, he passed on to his son James, spending the rest of his life at his home near Birmingham, where he still amused himself with inventions, his last work being a machine for copying sculpture. He presented copies of busts made by it to his friends "as the work of a young artist just entering his eighty-third year." He died Aug. 19, 1819. See *Lives of Boulton and Watt*, by Smiles.

JAMES WATT.

Wat'terson, Henry, American journalist and Democratic politician, was born at Washington, D. C., Feb. 16, 1840, and was educated by private tutors. Early in his career he took to journalism and edited at Nashville, Tenn., the *Republican Banner*. During the Civil war, he served on the staff of the Confederate army and was chief of scouts under Gen. Joe Johnston. He subsequently settled at Louisville, Ky., where he founded and has since edited the *Courier-Journal*, which he has made one of the foremost Democrat newspapers. During the years 1875–77 he was member of congress, and though repeatedly urged he has uniformly declined office, but has contented himself with presiding over conventions and supporting his Democratic friends and allies in their political contests. At Chicago, in 1893, he delivered the dedicatory oration at the opening of the World's Columbian exposition. In 1896, he declined the offer of a nomination for President on the National (gold) Democratic ticket. He has published a *History of the Spanish-American War*, and edited *Oddities of Southern Life and Character*.

HENRY WATTERSON.

Watts, George Frederick, R. A., a noted English artist, sculptor, portrait painter, and delineator of historical subjects, was born at London in 1817. He first exhibited at the Royal academy in 1837, his early pictures winning attention by their colossal size, as well as by their artistic excellence and beauty of coloring. His chief exhibits have been *Caractacus*, *Alfred the Great*, *St. George and the Dragon*, *Cymbeline*, *Fata Morgana*, *Life's Allusions*, *Endymion*, *Love and Death*, *The Good Samaritan*, *Hope*, *Sir Galahad*, *Orpheus and Eurydice*, together with portraits of *Tennyson*, *Browning*, *Gladstone*, *Lord Lytton*, *Matthew Arnold*, *Holman Hunt*, *Swinburne*, *Dean Stanley*, and *John Stuart Mill*.

Watts, Isaac, an English hymn writer, was born at Southampton, England, July 17, 1674. He is said to have written hymns for his mother when seven or eight years old. He became a clergyman, and was pastor of the Independent Congregation of Mark Lane, London, for a number of years, having an assistant and preaching only occasionally, as his health was permanently injured by overstudy when a young man. In 1712, a visit to Sir Thomas Abney, of Abney Park, a London alderman, led to his making his home with this friend for the remainder of his life. He wrote a number of theological works, a treatise on *Logic*, and a volume on *The Improvement of the Mind*, which has been much used as a textbook. His reputation, however, is due to his hymns, of which he published three volumes, *Hymns and Spiritual Songs*, *Psalms of David Imitated in the Language of the New Testament*, and *Divine Songs in Easy Language for the Use of Children*. A large number of his hymns and psalms are still retained in church collections, many of them our best-known hymns, such as *Before Jehovah's Awful Throne; O! God, Our Help in Ages Past; Joy to the World, the Lord has Come*, and *Come Holy Spirit, Heavenly Dove*. His beautiful "cradle hymn," *Hush, My Dear, Lie Still and Slumber*, is perhaps the best known of his children's songs. He died Nov. 25, 1748. See *Lives of the Poets*, by Johnson.

Wat Ty'ler, the leader of a rebellion in England, in the reign of Richard II. A poll tax was levied on every one over fifteen years of age, which was very odious to the people. When Walter "the Tiler" killed a taxgatherer who had insulted his daughter, the people were ready to rally around him. The insurgents numbered 100,000 by the time they had reached London, where they took possession of the Tower and put to death the archbishop of Canterbury and others. The first demands of the rebels were granted, but Tyler grew insolent and was killed by the mayor of London (June 15, 1381). Richard II., in his sixteenth year, took command of the rebels, and succeeded in leading them back to their homes, but when they were once scattered the promises made to them were not kept, and many of them were severely punished.

Wauke'gan, a city of Illinois, on Lake Michigan, thirty-five miles northwest of Chicago. It is built on a bluff on the lake shore. On account of its mineral springs and pleasant situation, it is quite a popular summer resort. There are several important industries, among them a sugar refinery, wire mills, brass works, scale works, a table factory, and manufactures of brick and tile. At North Chicago, a village a few miles south on an electric railway, are large zinc works. Population 9,426.

Waukesha (*wau'ke-shaw*), a town of Wisconsin, twenty miles west of Milwaukee, is one of the most popular summer resorts in the country. There are ten mineral springs, the Bethesda being the largest and the first discovered, in 1868. The water is shipped to all parts of the world, the works covering twenty acres. There is a very large hotel, and fine bathing houses, with beautiful parks and drives. Population, 7,419.

Wau'saw, Wis., a city on the Wisconsin river, the capital of Marathon county, central Wisconsin. It is on the Chicago, Milwaukee, and St. Paul, and on the Chicago and Northwestern railroads, and is 180 miles northwest of Milwaukee. It lies in a heavily timbered pine belt, and its industries, consequently, are chiefly mills for dressing lumber and the manufacture of furniture, sashes, doors, blinds, together with planing-mills. It has also machine shops, foundries, and cigar factories, besides mining and granite-quarrying. Population 12,354.

Wave Mo'tion, a state of disturbance being propagated from one part of a medium to another. A body is said to be *disturbed* when it is thrown out of equilibrium. Thus a stone dropped into quiet water produces a disturbance which at a later instant may reach a point several yards away. And since a body is in equilibrium only when its potential energy is a minimum, a disturbance implies the addition of energy to the system. Indeed, wave motion might be defined as one of the two principal methods for distributing energy, the other being *currents*.

In any consideration of wave motion, it is quite important to distinguish carefully between the motion of the wave and the motion of the particles of the medium through which the wave is traveling. Waves are roughly divided into two classes, according to the motion of the particles. If these motions occur in the same direction in which the wave is traveling, the wave is said to be a *longitudinal* one; but if the particles are displaced in a plane which is perpendicular to the direction of propagation, the wave is said to be *transversal*. If the period of vibration of one of the disturbed particles of the medium is T, and the length of the wave be λ, then the speed of the wave V is given by the following equation:—

$$V = \frac{\lambda}{T}$$

This is a perfectly general expression, true for all kinds of waves whatsoever.

Following is an outline of some of the more important types of waves met with in nature:—

Water Waves.— These are the ordinary waves encountered at sea and at the seashore. They are really due to gravitation, which tends to pull down the crest and elevate the trough of a disturbance as if the surface of the water were elastic. They are more properly called *Surface waves*,

The motion of the small particles which make up the water must be carefully distinguished from the motion of the waves. The motion of the particles in surface waves is in a circle, which gives to the outline of the wave a form very approximately that of a trochoid. The speed with which water waves travel depends very greatly upon the depth of the water.

If the depth of the water is greater than half a wave-length the speed of a wave is $\sqrt{\frac{g\lambda}{2\pi}}$ where g is the acceleration of gravity and λ is the length of the wave. The longer the wave, therefore, the faster it travels. But in case of shallow water, the speed of the wave is $\sqrt{gh}$, where g, as before, is the acceleration of gravity, and h is the depth of the water. The speed of waves in shallow water is, therefore, independent of wave length.

Ripples.— In the case of water waves which are very short — say less than about 4 millimeters — the surface tension (See SURFACE TENSION) of the water is the principal factor in determining the speed of the waves which is $\frac{2\pi T}{\lambda \rho}$, where T is the value of the surface-tension, λ the wave length, and ρ the density.

The slowest of all waves are those which are about 16 millimeters long. Waves shorter than this are called "ripples." It is important to note that the speed of ripples, unlike that of waves, varies *inversely* as the wave-length.

Waves in Stretched Strings.—These waves are seen when a stretched clothes-line is struck with a walking stick. They occur also in all stringed musical instruments, and often in long belts in power-houses. The speed of the wave here depends upon two factors only, *viz.*, the tension or the force with which the string is stretched, say F, and the mass per unit length of the string say, μ.

Then

$$Speed = \sqrt{\frac{F}{\mu}}$$

Sound Waves.—These travel in gases, liquids, and solids. The character of these waves is described in the article ACOUSTICS, in this work. There also will be found the evidence for thinking that sound is a wave motion.

The speed of sound-waves in air was first computed by Newton and Laplace, and found to be as follows:

$$Speed = \sqrt{\frac{\gamma p}{\rho}}$$

where p denotes the pressure of the air, ρ its density, and γ a constant, *viz.*, the ratio between the specific beats of air at constant pressure and at constant volume.

In the case of a sound-wave traveling in water we have,

$$Speed = \sqrt{\frac{Bulk\ Modulus}{Density}}$$

But in case sound travels through a solid rod, as for instance a fence made of gas pipe, we have,

$$Speed = \sqrt{\frac{Young's\ Modulus}{Density}}$$

Light Waves. The evidence that light consists of a wave motion is presented in the article LIGHT in this work. Concerning the nature of light waves, very little is known; but it used to be thought that they were elastic disturbances in a solid ether, in which case the speed of light waves would have been given by the following equation: —

$$Speed = \sqrt{\frac{Rigidity\ of\ Ether}{Density\ of\ Ether}}$$

It is now generally believed that light consists in electrical disturbances of the ether, in which case the speed of light waves would be determined as follows: —

$$Speed = \sqrt{1/\mu\kappa}$$

where μ is the magnetic permeability of the medium and κ the specific inductive capacity of the medium.

Besides these, there are many other kinds of waves, such as the tides, barometric waves, temperature waves, solitary waves, etc., the discussion of which is beyond our limits of space. For these, as well as the composition of waves, stationary waves, etc., the larger treatises must be consulted. One of the best of these is Lamb's *Hydrodynamics* (Cambridge, 1895). HENRY CREW.

Wax is a solid, fatty substance of animal and vegetable origin. It is harder than fat, and does not melt so easily. It will not dissolve in water, and burns with a bright flame. Bees' wax, Chinese insect wax, and spermaceti are animal waxes, while Japanese wax, palm wax, and myrtleberry wax are vegetable waxes. Bees' wax is secreted by the bees, and forms the cells in which they store honey. It is prepared by draining out the honey, and melting the comb in boiling water, and collecting the wax from the top of the water as it cools. It is, in its natural state, a light yellow color, and is made into white wax by bleaching. It is produced in large quantities, and used mainly for the manufacture of candles. Chinese wax is supposed to be the product of an insect. It is found as a thin white coating on the branches of certain trees, and is removed with boiling water. It is white, like spermaceti, and is used for candles. Japanese wax is got from the fruit of a tree by boiling it and collecting the wax; palm wax is scraped from the branches of two kinds of South American palms; and carnauba wax is found on the leaves of the carnauba palm, and is obtained by drying the leaves and shaking off the wax like dust. Myrtleberry wax or candleberry

wax is made from the berries of the wax-myrtle or bayberry, and as it burns about as well as bees' wax and costs only a quarter as much, it is largely used. Mineral wax is a substance found in small quantities oozing from rocks in coal regions. Paraffin, produced from shale and petroleum, is also much used as a wax for candles, etc. See SPERMACETI, BEES, PARAFFIN, etc.

Wax'wing, the name for birds having the wings, at times, ornamented with small spots that look like red sealing-wax. There are two species in North America, the cedar bird and the Bohemian waxwing. The former nests from Virginia to Labrador, and is found in winter from Massachusetts south to Costa Rica. It is about 7.2 inches long, with a plumage grayish brown above and yellowish below. There is a black stripe running across its face, and the head is crested. The secondaries of the wings are sometimes provided with red wax-like tips. These birds live in flocks and fly in close rank. Their food varies with the season, but consists largely of cedar berries, soft fruits, and insects. The Bohemian waxwing is a more northern bird, but is found south in winter. It is slightly longer than the cedar bird, and has a distinct purple cinnamon color on the head. Similar birds are found in Europe.

Way'land, Francis, an American clergyman, was born at New York, March 11, 1796. He graduated at Union college, and studied both medicine and theology, becoming pastor of a Baptist church in Boston. In 1826, he was made president of Brown university, Providence, R. I. He was one of the first teachers to make the study of Greek and Latin a matter of choice in a college course. He is well known as a writer, his works on moral science and intellectual philosophy having been quite generally used as textbooks. He died at Providence, R. I., Sept. 30, 1865.

Wayne (*wān*), **An'thony,** American general, was born at Waynesborough, Pa., Jan. 1, 1745. He became a surveyor and was elected by Benjamin Franklin to form a settlement in Nova Scotia. When the Revolutionary war began, he raised a regiment of volunteers, and served first in Canada, at the battle of Three Rivers, and in command of Fort Ticonderoga. While with Washington in New Jersey, he commanded the rear guard at Brandywine, led the attack at Germantown, captured supplies for the army at Valley Forge, and surprised the garrison at Stony Point, on the Hudson, one of the most brilliant operations of the war, for which he received a gold medal and the thanks of congress. In Virginia, he saved Lafayette's forces, and assisted in the capture of Cornwallis. He was made major-general, and commander-in-chief in the war against the Indians in 1792, and was made the commissioner to treat with the Indians and to take possession of the British forts in the northwest. He gained the title of "Mad Anthony" by his dash and bravery. He died on his western expedition at Presque Isle (now Erie), Pa., Dec. 15, 1796. See *Life and Services*, by Moore; also Spark's *American Biography*.

Weasel (*wē'z'l*), the name of a number of small carnivorous mammals related to the sable, mink, and skunk. They have a remarkably slender, round body with a long neck, which gives the animal the appearance of having the fore legs set back too far. The legs are very short. The common weasel, found both in the Old and the New Worlds, reaches a length of eight or ten inches; it is light reddish brown and whitish below, and in northern districts becomes whitish in winter. It feeds on mice, moles, and rats, following them into their holes, and even rabbits fall a prey to it. It rarely visits hen-yards. It ranges in America east of the Rocky mountains, and south to the border of the southern states. The stoat, or ermine, likewise inhabits Europe, Asia, and America, ranging, east of the Rocky mountains, from the extreme northern limit of terrestrial animals to the southern states. It is eight to eleven inches long. In summer, its color is mahogany brown, with a black tip to the tail. In winter, it changes, in northern regions, to a pure white except the tip of the tail which remains black. Other examples are the brindled weasel of the western coast, found from California to Ecuador, and the long-tailed weasel of the northwest.

Wea'ver Bird, the common name for a number of sparrow-like birds that show especial skill in weaving their nests. This is so thoroughly fixed a characteristic, that they

YELLOW-CROWNED WEAVER AND NEST.

keep up their weaving habits in captivity when material can be obtained, even weaving fibers about their cages. There are about 250 spe-

cies of this bird, belonging mainly to Africa. Those outside Africa inhabit the oriental region and Australia. There are none in New Zealand or in America. They are small birds, usually of plain colors, but the males become brightly colored during the breeding season. Some of them construct hanging nests, shaped like a pouch, and suspended from high, slender branches. They are closely woven and elongated into a tube opening from below. The social weavers of South Africa are the most noteworthy. A number of birds unite in building an umbrella-shaped structure of coarse grass to form a protection for their nests. The individual nests are placed below this roof and open downward. The roof not only sheds the rain, but enemies like snakes and other animals will slip from it in attempting to get to the nests. As many as 800 or 1,000 nests have been found under a single canopy. Year after year the nests are added to, and sometimes break the branches by which they are supported.

Weav'ing, the art of making cloth by interlacing threads of any substance, such as cotton or wool. The machine employed is a loom, which has improved from the simple hand looms of the Egyptians and other ancient nations, to the complicated machines used at the present time in weaving silk, cotton, carpets, and other woolen goods. The introduction of the power loom instead of the hand loom dates back two centuries, the first successful one being the invention of Cartwright, in 1784, of which the Jacquard loom is the most important improvement. The process of weaving is seen best in the common mode of darning, where a set of lengthwise threads are first fastened firmly and then crossed by other threads, which are woven in and out by taking up one thread and leaving one. In weaving, the threads are fastened in the loom, as many as are necessary for the width of the goods. This is called the warp. The cross thread is wound on spools, or bobbins, in a shuttle and forms the weft, or woof. By a movement of the loom, the alternate threads are raised and the shuttle passes between the two sets of threads. In hand looms, the shuttle is thrown by hand, but moved by machinery in the power loom. The raised threads are then lowered and the lower threads raised, and the shuttle returned to the side whence it came, crossing in this way the threads alternately. The thread in the shuttle is thus carried back and forth, forming the well-known "selvedge" to woven goods. When every other thread is taken up, it is called plain weaving; but there are many varieties introduced, such as taking up one thread and leaving two or three, etc. The quality of the threads also varies, making wool goods with cotton or silk warp, velvet with silk or linen warp, etc. The colors and figures are sometimes stamped on plain goods, when the "wrong side" will present a plain surface; in other goods they are made in the weaving by the use of colored threads. See *Theory and Practice of the Art of Weaving*, by Watson.

Webb, Alexander Stewart, American general, and since 1869 president of the College of the City of New York, was born at New York, Feb. 15, 1835, and graduated in 1855 at West Point, when he entered the United States army, artillery branch. In the Civil war, he served in the army of the Potomac, was chief of staff of the fifth corps in the Maryland and Rappahannock campaigns, was wounded at Gettysburg, where he commanded a brigade, commanded a division in the Rapidan campaign, and led a brigade at the battles of the Wilderness and Spottsylvania (was severely wounded at the latter), and was chief of staff to General Meade till the close of the war. He subsequently held several important army posts until he retired from the army in 1870, acting also as a professor at West Point, until appointed president of the College of the City of New York. He is the author of a work on McClellan's campaign of 1862, entitled *The Peninsula*.

Weber (*vā'ber*), **Karl Maria von,** a German composer, was born in Holstein, Dec. 18, 1786. He early showed the musical genius which he inherited from his father. By the time he was fourteen, he had already composed two operas, the second one, *The Forest Maiden*, being put on the stage. He held several positions, such as conductor of the opera at Breslau, musical instructor in the family of Duke Louis at Stuttgart, director of the opera at Prague and at Dresden, and musical director to the king of Saxony. His work includes operas, symphonies, and overtures for the piano, clarionet, oboe, bassoon, and violoncello, and a large number of songs, among them a series of national songs from Körner's *Lyre and Sword*, which roused the patriotic sentiment during the war of liberation. His best opera, *Der Freichutz* (The Archer), was produced in 1822 at Berlin, and created a great sensation throughout Europe, so that Charles Kemble asked him for an opera for the English stage. *Oberon* was written in answer to this request, and brought out under his own direction at London in 1826, where he was greeted with enthusiastic applause. He died while on this visit to England, June 5, 1826. See *Life*, by his son, translated by Simson.

We'ber, Wilhelm Eduard, who has been called the "Nestor of German physicists," was born at Wittenberg on the 24th of October, 1804. At the suggestion of Gauss he was appointed professor of physics at the University of Göttingen; but in 1837 he was compelled to resign on account of antagonism to the state authorities. Living for the next six years as a private citizen, he was in 1843

appointed to the chair of physics in the University of Leipsic; but was recalled to his old place in Göttingen in 1849. The volume on *The Theory of Waves* (Wellenlehre), which he published with his brother, E. H. Weber, in 1825, is the first scholarly experimental treatment of water waves in existence. But perhaps Weber's chief service to science was the introduction of the absolute system of units into physical measurement — a work which he performed conjointly with Gauss. The invention of the earth-inductor and the electro dynamometer are also due to Weber. As early as 1833, Gauss and Weber had connected the observatory and physical laboratory at Göttingen by means of a telegraph line. Weber died at Göttingen, June, 23, 1891.

Web'ster, Daniel, American statesman and orator, was born at Salisbury (now Franklin), N. H., Jan. 18, 1782. His family came from Scotland, and settled in New Hampshire in 1636. His father, Ebenezer Webster, rose to the rank of captain in the French and Indian war. Living on the frontier, Daniel was forced to depend for his early teaching on his mother and on the scanty schooling to be had in winter; and for much of this he was indebted to the fact that he was physically the weakest of the family. It is a little odd, however, that he failed utterly in that in which his reputation afterwards became so great. As he said: "There was one thing I could not do: I could not speak before the school." When he was fifteen years old, a family council decided to send him to college, a step making necessary hard economy and an extra struggle at home. After a poor preparation he entered Dartmouth college, paying part of his expenses by teaching in winter, and

DANIEL WEBSTER.

graduated in 1801. He then taught in a Maine academy for a year, getting a salary of $350, the greater part of which he saved to help a younger brother through college, earning money to pay his board by copying deeds during the winter evenings. After studying law and being admitted to the bar at Boston in 1805, he began to practice in the town of Boscawen near his early home. But his father died within a year, and he opened an office in Portsmouth, the largest city of the state. Here he took a leading place at the bar, having but one rival. In May, 1813, he entered congress, and was placed at once on the committee of foreign affairs. As a Federalist he held that attacks on Canada should stop, and the war be confined to the ocean. His first speech showed that he was no longer the raw New Hampshire boy of a dozen years before, and that a new power had arisen in oratory. But at this time the influence of a Federalist in congress could not be great, and Webster, removing to Boston in 1816, gave up political life for some years.

At the Massachusetts bar, Webster soon gained a place as prominent as he had held in New Hampshire, and within three years his reputation as a lawyer became national. His national standing was gained in the "Dartmouth college case." In 1816, the New Hampshire legislature undertook to change the college charter given it by the English king in 1769. A suit brought by the old trustees was appealed to the supreme court in 1818, before which Webster claimed that the legislature's action was against the provision of the constitution, which forbids a state to alter contracts. The decision of the supreme court, which upheld Webster's view, is one of the most important in its history. From this time Webster was recognized as the leading lawyer of the country, and his services were in constant demand. The most celebrated of his criminal cases was the trial of Knapp for murder, in which is the passage on conscience that has been declaimed by countless schoolboys.

Webster's reputation as an orator began with his speech at Plymouth in 1820, on the 200th anniversary of the landing of the Pilgrims. Others of these great addresses were the speech at the laying of the corner stone of the Bunker Hill monument in 1825, fifty years after the battle; and that in 1826 on the deaths of Jefferson and John Adams, on the same day, the fiftieth anniversary of the Declaration of Independence. On every great public occasion, after this, if Webster could be had, he was the chosen speaker.

In 1823, Webster again entered congress, where his first speech on the Greek revolution made him the first of congressional speakers. Four years later, Massachusetts sent him to the senate, where he remained until his death, except while serving as cabinet minister. In January, 1830, came the crowning event of his political life. A debate on public lands, known as "Foot's resolution," had wandered off into all possible fields. In the course of it, Hayne, of South Carolina, attacked New England. Webster answered

him; but it was in answer to Hayne's second speech that he made the famous "second speech on Foot's resolution," in which occurs the oft-quoted defense of Massachusetts, and which goes on to trample on the South Carolina doctrine of nullification (see CALHOUN). It was on this speech that the orator's fame was built. Southern men had taken the lead so long that it was a new feeling in the north and west to see a southern leader overmatched by their champion, and "Black Dan Webster," a popular name, due to his dark complexion, beetling brows, and heavy cast of features, was for twenty years the representative of northern feeling as to the nature of the Union. When the Whig party came into power in 1841, Webster was appointed secretary of state, and though on General Harrison's death the other cabinet minsters resigned, he remained under Tyler. This course lost him strength with the Whigs, but he felt that he was needed to settle many important questions, such as the searching of American vessels by the British on the coast of Africa, and the Maine boundary. These matters Webster settled by the Ashburton treaty with England in 1842. He was back in the senate in 1845, and on March 7, 1850, delivered his speech on the compromise between the north and the south, which had now drifted widely apart. Webster's keynote in the speech, as it had been all along, was for the Union first and foremost, detesting all whom he held to be its enemies, whether abolitionists or nullifiers. This speech destroyed his last hopes of reaching the presidency. He died Oct. 24, 1852, while secretary of state under Fillmore.

Web'ster, Noah, an American scholar, was born at Hartford, Conn., Oct. 16, 1758. He studied at Yale college and served in the militia under his father in the Revolutionary war. While a teacher at Goshen, N. Y., he published *Grammatical Institutes of the English Language*. He published books and lectured on political subjects, taught an academy at Philadelphia, practiced law at Hartford, edited a magazine and a newspaper, and wrote pamphlets on epidemic diseases, banking, and international law. In 1807, he published a grammar and began his *American Dictionary of the English Language;* but decided to fit himself more perfectly for the work, and spent ten years in the study of the origin of the English language and its connection with other languages. Seven years were then spent on the dictionary, including a visit to Europe to consult books and scholars, both at Paris and at Cambridge. The dictionary was published in 1828, in two volumes in the United States, followed soon by an edition of 3,000 in England. It has long been the standard dictionary of the English language, and has passed through many editions and revisions. More than 300,000 copies have been sold yearly and the income from the book is still about $25,000 a year. As celebrated as the dictionary is *Webster's Spelling Book*, which was used for many years in every school in the land, and of which more than 70,000,000 copies have been sold. Webster published also a *History of the United States*. He was one of the founders of Amherst college and a member of the Massachusetts legislature while residing in Amherst, and of the Connecticut legislature when living at New Haven. He died May 28, 1843. See *Life*, by Scudder.

Wedg'wood, Josi'ah, an English potter, was born at Burslem in Staffordshire, England, in 1730. He learned his trade from his father, but was not satisfied with merely carrying it on in the old methods, but made effort toward improvement. He succeeded in producing a cream-colored porcelain which was known as queen's ware. He extended his improvements also to the form and decoration of his pottery, copying from ancient models and employing the sculptor Flaxman to design for him. He thus raised the rude manufacture of pottery in England to a high position as an art. He built large factories near Burslem for the manufacture of the Wedgwood ware, invented by him in 1775, calling the village Etruria. His liberality and public spirit equaled his wealth, and he was known also as a writer on philosophical subjects. He died Jan. 3, 1795. See *Life*, by Meteyard.

Weed, Thurlow, an American journalist, was born at Cairo, N. Y., Nov. 15, 1797. At ten, he was a cabin boy on a sloop on the Hudson river, and at twelve an apprentice in a printing office at Catskill, N. Y. He served as a volunteer in the War of 1812. He established the *Agriculturalist* in western New York, editing several other journals until he was selected as the editor of the *Albany Journal*, the organ of the Whig party. Here he became an acknowledged leader of the Whig and Republican party, and had great influence in securing the nominations of William H. Harrison, Taylor, and Scott. In 1865, he moved to New York city and became editor of the *New York Times*, and afterward of the *Commercial Advertiser*. He died at New York, Nov. 22, 1882.

Wee'vil, a common name for a number of beetles with long snouts, abundant in the United States. Some of the most destructive insects belong to this family of beetles. The plum weevil, for example, often destroys a large part of that fruit. The female bores a hole in the fruit with her snout, and lays an egg in the cavity; the egg is then pushed to the bottom with the snout. The larva hatches and feeds upon the fruit, which spoils and drops off the tree. The same insect infests cherries, but the wormy cherries hold to the tree. It is also destructive to apricots and peaches. Fortunately, this species is not found on the Pacific coast. The acorn weevil

and the nut weevil are destructive to acorns, hickory nuts, and chestnuts, the snout being in all cases used to make a hole for the eggs. Apple and strawberry weevils attack those fruits, and the latter are especially destructive when they get into a strawberry patch.

Weim'ar (*vī'mär*), a town in Germany, capital of Saxe-Weimar, is sixty miles southwest of Leipsic. It is on the Ilm river, in a pleasant valley, and though a court residence, has little trade and no manufactures. It is celebrated as the home of Goethe, Schiller, Herder, and Wieland. The ducal palace has rooms decorated with frescoes illustrating the works of these authors, the public library contains busts of them, and there is a double statue of Goethe and Schiller, one of Herder, and one of Wieland, and the tomb of Herder is in the town church. There is a gymnasium, a free school of design, a public library, a theatre, once famous under Goethe's and Schiller's management, and a fine musem. Population 27,000.

Weir (*wēr*), **Robert Walter,** an American painter, was born at New Rochelle, N. Y., June 18, 1803. After studying in Italy several years he was made professor of drawing at West Point, N. Y., where he remained for forty-two years. His best-known works are *The Landing of Henry Hudson, Columbus before the Council of Salamanca, Indian Captives,* in the Boston Athenæum; *Embarkation of the Pilgrims,* in the rotunda at Washington; and *Christ in the Garden.* Some of his works in private collections at New York are very fine, as a *View of Hudson from West Point; Rebecca,* from *Ivanhoe;* and *A Pier at Venice.* He died at New York, May 1, 1889.

Weismann (*vīs'man*), **August,** a distinguished German zoologist, was born at Frankfort-on-the-Main, Jan. 17, 1834, and studied medicine at Göttingen, Paris, and Vienna. He early showed a decided fondness for natural science, being specially interested in biology. In 1873, he was appointed professor at Freiburg, and has since devoted himself enthusiastically to research. His writings embrace *Studies in the Theory of Descent, Germ Plasm, Essays on Heredity,* and other works bearing on Evolution.

Wel'land, a Canadian river which flows east sixty miles and empties into the Niagara. It was used as a part of the Welland canal, built to connect Lake Erie and Lake Ontario, and to enable vessels to pass around Niagara Falls.

Welles, (*welz*) **Gideon,** American statesman was born at Glastonbury, Conn., in 1802. He was for many years editor and part proprietor of the *Hartford Times.* While a member of the Connecticut legislature, he secured the abolishment of imprisonment for debt. He held a position in the navy department under President Polk, and was made secretary of the navy under President Lincoln, holding the position for eight years. He found the navy at the beginning of the Civil war without a single warship, yet succeeded in maintaining a blockade for over 2,000 miles of coast, and formed a fleet of ironclads and transports on the Mississippi river. He died at Hartford, Conn., Feb. 11, 1878.

Wellesley (*wĕlz'lĭ*), a town in Massachusettes, fifteen miles west of Boston, where is situated Wellesley college, one of the largest colleges for women in the country, opened in 1875. It is intended to give to women as high an education as the best colleges in the land, and requires the same entrance examination, with the exception of Greek. There are seven courses to select from. There is a large building, with grounds covering 300 acres, a library, a reading room, gymnasium, etc. Population 5,072.

Welles'ley, Richard Colley, Marquis of, a British statesman, brother of the duke of Wellington, was born at Dublin, June 20, 1760. He studied at Eton and Oxford, took his seat in the Irish house of peers, and was one of the original Knights of St. Patrick when the order was formed in 1783. In 1784, he obtained a seat in the British house of commons, and in 1797 entered the house of lords as Baron Wellesley. He was sent to India in 1798 as governor-general, where he found the British possessions threatened by the French in alliance with Tippo Sahib, a powerful native prince. He secured the French officers who were over the native troops, sent them out of the country, and defeated Tippo Sahib, who was slain in battle. He effected a treaty with Persia, and carried on successfully the Mahratta war, which ended by making England the great power in India, adding forty million people and $50,000,000 of revenue to her kingdom. He built the palace of Calcutta, founded the College of Fort William, and introduced financial reforms that doubled the revenues of the East India company. The great expense of his administration and charges of cruelty to native princes were the complaints made against him, and articles of impeachment were presented but rejected by the house of commons. He was ambassador to Spain, secretary of state, lord lieutenant of Ireland, and lord chamberlain. He had an annuity of $25,000 from the East India company, and a gift of $100,000 toward the close of his life. He died at London, Sept. 26, 1842.

Wel'lington, Arthur Wellesley, Duke of, one of England's greatest generals, was born at Dungan castle, Ireland, May 1, 1769. He studied in a military college in France. His first actual service was in command of a regiment in the Netherlands in 1794. While his brother was governor of India, he won his first fame in the Mahratta war with the bril-

liant victory of Assaye, gained with 4,500 men against 40,000 Mahratta troops. After serving in Hanover and Denmark, and commanding an expedition sent to Portugal, he was put in command of the peninsular army in Portugal and Spain, which was opposed to the veteran forces of Soult and Victor. He won, July 27 and 28, 1809, the battle of Talavera, for which he was created a peer and given a pension of $10,000. He carried the war into Spain, which was held by the French, gained the battles of Badajos and Salamanca, and was made general in chief of the Spanish armies, as he had already been of the Portuguese forces. His pension was doubled, and $500,000 given him to purchase lands. He followed the retreating army into France, took Pamplona, and defeated Soult under the walls of Toulouse. He received for the twelfth time the thanks of parliament, and a gift of $2,000,000. When Napoleon escaped from Elba, Wellington was put in command of the British forces; while the Prussian army was led by Blücher and June 18, 1815, came the great battle of Waterloo, which finally crushed the power of Napoleon. The allied armies marched upon Paris, and Louis XVIII. entered the city the day after the English army. Wellington took command of the army of occupation, living in Paris for three years, where two attempts were made upon his life. He was created field-marshal of the armies of Russia, Prussia, and Austria, and prince of Waterloo by the king of the Netherlands, while parliament added $1,000,000 to its former gift. He represented Great Britain at the congress of Verona, was sent on an embassy to Russia, and became commander-in-chief of the British army. His political career, during which he filled the first positions in the country, lost him much of his great popularity, as he took a firm stand against reform, his opposition to the reform bill being followed by an attack of a London mob on his house, and hooting and pelting in the streets. His share in the repeal of the corn laws restored the "Iron Duke," as the people loved to call him, to popularity. He died at Walmer Castle, Kent, Sept. 14, 1852. See *Lives* by Browne, Gleig, Maxwell, and Yonge, and *Dispatches and Memoranda*.

Wells, David Ames, an American economist of note, free trader, and lecturer, and writer on economics and political science, was born at Springfield, Mass., June 17, 1828, and died at Norwich, Conn., Nov. 5, 1898. After graduating at Williams college, and at the Lawrence Scientific school, Harvard, he was for a time associate editor of the *Springfield Republican*, and took a hearty interest in the publication for a series of years of *The Annual of Scientific Discovery*. In 1866, he was appointed United States commissioner of revenue; in 1877 was chairman of a commission to report upon the laws relating to taxation in the state of New York; and generally took a prominent part in discussions of the time on financial and economic subjects. He was an industrious and prolific writer. Among his published works are text-books on *Familiar Science*, the *Science of Common Things*, *Elements of Natural Philosophy*, and *First Principles of Geology*, and in economics *Production and Distribution of Wealth*, *Practical Economics*, *The Relation of the Tariff to Wages*, *Recent Economic Changes*, and *The Principles of Taxation*. He also published *Robinson Crusoe's Money*, and a work entitled *Our Merchant Marine*.

We'ner, Lake. See SWEDEN.

Weser (*vā'zer*), one of the chief rivers of Germany, flows through Prussia and empties into the North sea. It is 260 miles long, but of little use for navigation.

Wes'leyan Univer'sity, at Middletown, Conn., was founded in 1831, and is the oldest of the colleges established under the auspices of the Methodist Episcopal church. It has 35 instructors, and an attendance of 350 students.

Wes'ley, Charles, was born at Epworth, in Lincolnshire, England, Dec. 18, 1708. The name is thought to be the same as Wellesley, and Garrett Wellesley offered to make Charles Wesley his heir if he would settle in Ireland, but the offer was declined, and the estate went to another branch of the family, from which came Arthur Wellesley, duke of Wellington. Charles Wesley, after studying at Oxford, went to Georgia with his brother John. On his return to England, he took an active part in the work of forming the Methodist church. He is especially known as a hymn-writer, some of the most beautiful hymns in church collections being his work. *Jesus, Thy Robe of Righteousness*, and *Blow Ye the Trumpet, Blow*, are among the best known of his large contributions to the music of the church, which numbered 4,100 published hymns and 2,000 in manuscript. He died at London, March 29, 1788. See *Life*, by Jackson.

Wes'ley, John, the founder of Methodism, was born at Epworth, in Lincolnshire, England, June 17, 1703. He was made a fellow in Lincoln college, Oxford, where, with his brother Charles and a few others, he began a systematic course of religious exercises that gave them the name of Methodists. In 1735, he went to Georgia as preacher to the colonists and missionary to the Indians, and became impressed with the views of the Moravians who were his fellow-passengers at sea. His strict discipline was distasteful to the colonists, and after two years he returned to England. Here he studied the Moravian doctrines, and ascribed his conversion to a Moravian meeting at London. He began his preaching at London, and soon joined Whitefield in open air services, sometimes deliver-

ing 800 sermons a year. The meetings were attended by thousands, especially in the mining and manufacturing districts. Persecution and opposition resulted in Wesley's forming "bands" for prayer, and a church society, and finally in his ordaining preachers to be sent to America, Scotland, etc., thus separating entirely from the Church of England. He traveled nearly 270,000 miles, usually on horseback, and preached over 40,000 sermons. He wrote a large number of volumes on religious subjects, and published with his brother Charles a collection of hymns. He died at London, March 2, 1791. See *Lives*, by Southey, Watson, Moore, etc., and *History of the Religious Movement of the 18th Century*, by Stevens.

West Bay City. See BAY CITY.

West, Benjamin, an American painter, was born at Springfield, Pa., Oct. 10, 1738. His first portrait was a picture of his baby sister, smiling in her sleep, made when he was seven years old. His colors were made from berries, and his brush was of hairs stolen from the cat's tail. His first work was done at Philadelphia and New York, but in 1760 he went to Italy for further art study, and after three years of training settled in London. Here he became famous at once, and was appointed historical painter by George III. He was one of the four artists who formed the Royal academy, and was chosen to succeed Sir Joshua Reynolds as its president. His paintings were mostly on historical and religious subjects, on a large scale, in imitation of the old masters. The *Death of Wolfe*, the *Battle of La Hogue*, and *Christ Healing the Sick* are among his best paintings, of which he left nearly 400. He died in 1820, and was buried in St. Paul's, London. See *Lives of Eminent Painters*, by Cunningham; *Century of Painters of the English School*, by Redgrave.

West'cott, Brooke Foss, an English prelate, writer, and biblical scholar, was born near Birmingham in 1825, and educated at Trinity college, Cambridge. He was successively a Master at Harrow, canon of Peterborough, regius professor of divinity at Cambridge, canon of Westminster, and in 1890 was appointed bishop of Durham. His writings are numerous, embracing a *History of the Canon of the New Testament*, *Introduction to the Study of the Gospels*, *History of the English Bible*, *The Gospel of the Resurrection*, *The Gospel of Life*, *Social Aspects of Christianity*, *The Historic Faith*, *The Revelation of the Risen Lord*, and *Characteristics of the Gospel Miracles*.

West'ern Austral'ia forms about a third of Australia, and is 1,400 miles long and 850 broad, covering 975,920 square miles, with a coast line of 3,500 miles. The Murray, Blackstone, Swan, and Murchison, 400 miles long, the Fitzroy and the Ord, are some of the principal rivers. The country is mostly level, covered with forests, with a dry, sandy region in the interior and a few shallow salt lakes. The Darling, Victoria, and Herschel are the principal mountain ranges—not over 3,000 feet high. The eucalyptus, mahogany, red gum, York gum, jarrah, baobab, sandalwood, grass tree, paper-bark tree, and mangrove are some of the peculiar trees; while the kangaroo, wombat, wallaby, and "dingo" or wild dog, are found among the animals. The raising of sheep, goats, and cattle is the most important industry; the fisheries, including turtle, rock cod, snapper, etc., provide material for the canneries; and the pearl fisheries are increasing in value; salt, raisins, castor oil, honey, and wax, manna, gums, and wine are other products. Gold is found in Kimberley; magnetic iron ore at Mt. Magnet; lead and copper in the Victoria region, besides silver and plumbago. In 1899, the government expended $310,140 on its schools. There were 205 public schools, with 16,033 pupils in attendance, and 83 private schools with 5,812 pupils. There were at that time 1,850 miles of railway, and 8,749 miles of telegraph. Western Australia is a British colony, first settled by a convict colony at Port Jackson, but it made little growth until convict labor was introduced. From 1850 to 1868, 10,000 convicts were brought into the country. The capital is Perth (population 34,610). Population 178,196.

West Ho'boken, N. J., a flourishing town in Hudson county, N. J., on the Hudson river, adjacent to New York city. It is largely engaged in the manufacture of silk goods. It has a number of schools, churches, and civic buildings, a convent of the Sisters of St. Dominic, a Roman Catholic school, and a monastery of the Passionist Fathers. The population has more than doubled in the past decade, its inhabitants now numbering 23,094.

West In'dies, an archipelago of about 1,000 islands lying between North and South America. The island of San Salvador was the first land seen by Columbus, and he gave the name of West Indies to the region, thinking he had found a new route to India. The islands separate the Atlantic ocean from the gulf of Mexico, and are in four groups: the Bahamas, the Greater Antilles, including Cuba, Jamaica, etc., the Lesser Antilles, and the islands off the coast of Venezuela. The Bahamas are low coral islands, while the Antilles are mountainous and volcanic, having peaks from 6,000 to 8,000 feet high. The summers are very hot, and hurricanes are numerous and severe. Insects, snakes, lizards, scorpions, etc., abound, and the birds are especially beautiful. The forests produce mahogany, satinwood, crabwood, rosewood, and other valuable lumber. Ginger, pepper, pimento, aloes, sassafras, cochineal, and indigo are other products. The chief trade is in sugar

and tobacco. The mineral wealth is not great, though gold, silver, iron, copper, tin, lead, salt, and other minerals are found and worked to some degree.

The Spaniards began their dominion over the islands by enslaving the native tribes they found there, who at times revolted against their masters, but with no effect, and were almost exterminated. As a result of the Spanish-American war, in 1898, Porto Rico was ceded to the United States, and Cuba was freed from Spanish sovereignty. Guadaloupe, St. Bartholomew, Martinique, etc., belong to France; the Bahamas, Jamaica, Leeward and Windward islands, and Trinidad to England; some of the smaller islands to the Dutch, and some to the Danes; while Haiti is independent. Population (total estimated of the whole of the West Indies) 5,678,128.

West'minster Abbey is in the city of Westminster, which is now a part of London. On an island formed by a branch of the Thames, Sebert, king of the East Saxons, built a church in the 7th century, which was replaced, it is thought, by an abbey called Westminster, to distinguish it from St. Paul's or Eastminster. The first stone building on the site was built by Edward the Confessor, of which the Pyx house is a remnant. The present abbey was mostly built by Henry III., beginning in 1220 with a chapel. The west front with its great window was the work of Richard III., and Henry VII., who also built the chapel called by his name. Two towers were added by Sir Christopher Wren. The building is a cross, 511 feet long. It was used as the burying-place of the English kings, and is crowded with monuments. The shrine of Edward the Confessor was built by Henry III.; the tombs of Edward I., Henry III., Henry V., Edward III., and of most of the sovereigns from Henry VII. to George III. are within the walls. There are besides the two coronation chairs, one inclosing the stone brought by Edward I. from Scone, on which the Scottish kings were crowned. The most interesting part of the abbey is the "Poets' Corner" on the east aisle of the south transept, where are memorials of the great British poets, among them Chaucer, Dryden, Milton, Gray, Shakespeare, Addison, Thomson, Tennyson, and of the American poet Longfellow. The monuments of Pitt, Fox, Chatham, Canning, and Wilberforce, and of the great inventors Talford, Watt, and Stephenson, are in other parts of the building. See *Memorials of Westminster*, by Walcott.

Westpha'lia, a province in western Prussia, bordering on Holland. It is 110 miles long and 124 wide, including 7,803 square miles. The Lippe, Ruhr, Ems, and Weser are the principal rivers, the Weser crossing the Weser hills by a pass, called the Westphalian gate. The Lippe divides the country into two parts, the northern portion flat like Holland, and the southern portion with hills and valleys. The farming is carried on by small farmers with old methods, the most important crops being hemp and flax. Cattle, goats, and hogs are raised, the latter yielding the well-known Westphalian hams. Its mineral resources give it its great prosperity. There are large coal fields in the north, and it produces more iron ore than any province of Prussia, except Silesia. It is also rich in copper, zinc, sulphur, and salt. The leading manufactures are linen weaving and iron working. Westphalia was the name of the western part of the duchy of Saxony, and was divided when Henry the Lion's Saxon domains were distributed by the Emperor Maximilian, the archbishops of Cologne receiving a part, with the title of dukes of Westphalia. Napoleon formed the kingdom of Westphalia for his brother Jerome, which was abolished after the battle of Leipsic. The congress of Vienna (1815) finally gave Westphalia to Prussia. The peace of Westphalia at Osnabrück and Münster, in 1648, ended the Thirty Years' war. Population 3,188,072.

West Point, the seat of the United States Military academy, is a village on the Hudson river, fifty-two miles north of New York. It is a promontory, about 180 feet above the river, commanding the fine scenery of the Highlands, and surrounded by hills reaching from 500 to 1,500 feet in height. The military school was founded in 1802, and provides free education for 300 cadets, who are bound to serve in the army for eight years. Each congressional district can send one cadet and ten are appointed by the President. The course of training lasts four years, and the graduates have the rank of second lieutenant in the regular army. The buildings include several batteries, besides the library, stone barracks, and buildings for instruction, and contain many war relics and portraits of military heroes. West Point was guarded during the Revolutionary war by two forts and a chain across the river, which were taken by the British in 1777, but abandoned by them after Burgoyne's surrender. The point was afterward strengthened by forts and other works, which the commander, Benedict Arnold, was bargaining to betray to the British, when the arrest of Major André defeated the plot.

West Virgin'ia, one of the central states of the Union, lies mostly between Virginia and the Ohio river, with the narrow strip, called the "Panhandle," running for sixty miles between Ohio and Pennsylvania. It covers 24,645 square miles, nearly all of it being mountainous or hilly, which has given it the name of the Switzerland of America. The Alleghany mountains are on the eastern border, and in the western part of the state are Laurel hill, Greenbrier, Gauley, and Rich mountains, a continuation of the Cumberland range. The Potomac forms 100 miles of the northern boundary of the state and the Ohio 300 miles of the western border, with the

Monongahela, Great and Little Kanawhas, and the Big Sandy flowing into it. The Kanawha is 450 miles long and is navigable for 100 miles. Nearly all the lower hill country can be cultivated, and in the mountainous regions are broad, fertile valleys. A large part of the state is still covered with magnificent forests of pine, chestnut, ash, maple, etc., in places so dense that a stranger needs a guide. The coal fields cover 16,000 square miles, or a larger extent of country than Great Britain, and give the state the fourth place in the coal states of the country, while it is second in producing coke. Petroleum, natural gas, iron ore, salt, bromine, sandstone, marble, alum, and copper are other minerals found very abundantly in the state. The mineral springs, such as Greenbrier White Sulphur Springs, used by the Shawnee Indians and early white settlers, the Berkeley Springs, Red Sulphur Springs, Old Sweet, and Capon Springs, are all famous summer resorts, as are Deer Park, Oakland, and other places in the mountain region.

Corn is the largest crop, followed by wheat, oats, and tobacco. Ginseng is a peculiar product, a root dug out of the mountain, and exported mainly to China. The raising of horses, sheep, and cattle is a large industry; the great lumber business, with tanneries and wood-pulp mills in connection with it, and coal-mining are other industries. The manufactures are those of leather, iron, steel, glass, and pottery, with a peculiar variety of cigars, called "stogies," from the Conestoga wagons which traveled west from Pennsylvania in early days.

In 1894, there were 5,302 school buildings in the state. The elementary schools in 1898 had 6,734 teachers and 234,410 pupils; the high schools had 94 teachers and 1,778 pupils; there were several normal schools, and twenty-nine colleges and academies, among them, Bethany college near Wheeling, whose first president was Alexander Campbell, organizer of the Disciples of Christ, and the State university near Morgantown, which has an agricultural experiment station, and a law school connected with it.

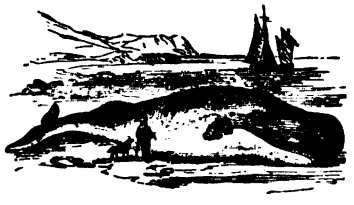
The first permanent settlers in West Virginia came from Pittsburg, and one of the first landowners was George Washington, who held 32,000 acres in the Ohio and Kanawha valleys. When the state of Virginia seceded, the western part, separated from the eastern part by the Alleghany mountains and closely connected with Ohio, refused to join in the movement, held conventions at Clarksburg and Wheeling, and formed the state of West Virginia, which was admitted into the Union in 1863. The battles of Philippi, Beverly, Rich mountain, Cheat mountain, and Carnifex Ferry, and John Brown's raid at Harper's Ferry were the chief actions on the soil of West Virginia connected with the Civil war. The chief town of the state is Wheeling (population 38,878). Population 958,800.

West Virgin'ia Univer'sity, located at Morgantown, was founded in 1867, as West Virginia Agricultural college. In 1868, by act of legislature, the name was changed to West Virginia university. The organization now includes colleges of art and sciences, engineering, and mechanic arts, agriculture, school of music, and commercial and preparatory schools. The faculty numbers 64, with an enrollment of 885 students.

Wet'terhorn, a lofty mountain in Switzerland, about ten miles from the lake of Brienz. It rises almost perpendicularly in one great wall of limestone, 12,200 or 14,105 feet, according to different measurements.

Wey'man, Stanley John, English novelist, was born at Ludlow, Shropshire, Aug. 7, 1855, and educated at Shrewsbury school and Christ church, Oxford. Studying law he was called to the bar, and practiced on circuit from 1881 to 1889, when his first work, *The House of the Wolf*—a romance of French history—appeared. After this, his health necessitated his traveling abroad and he abandoned law altogether. His later novels include *The New Rector*, *The Story of Francis Cludde*, and *A Gentleman of France*. The success of the latter, which was published in 1893, and at once translated into many European languages, was immediate, and has proved one of the most successful of recent historical romances. His later stories are *Under the Red Robe*, *My Lady Rotha*, *The Red Cockade*, *The Man in Black*, *The Castle Inn*, and *Shrewsbury*, and the *Memoirs of a Minister of France*. He is a vivid and picturesque writer, and has been most successful in his treatment of themes drawn chiefly from the era of mediæval France.

Whale, a marine mammal of fish-like form belonging to the order Cetacea. The dolphins are included with the whales. Few people realize what the term a marine mammal means as applied to whales, the fish-like form suggests an affinity with fishes, but they are warm-blooded animals, breathing by lungs, and suckling their young with milk—in short, ranking above reptiles and birds, in the class mammalia. There are two divisions, those



SPERM WHALE.

with teeth, as the dolphin and sperm whale, and those without teeth in the adult, but with whalebone plates inside the mouth. The latter group, often called the true whales, have teeth in embryonic stages, and the fact that

teeth arise and disappear before birth, is taken to mean that the whalebone whales are descended from ancestors which had teeth, and that the embryonic teeth are a matter of inheritance, but in the changed habits of the animal are not required. The whales have nostrils located on the top of the head, and in coming to the surface they spout or blow. They do not, however, as is generally supposed, throw out a jet of water. The column of spray is due to the condensing of their warm breath which is laden with watery vapor. The head, which in some species may make one-third the length of the entire animal, merges into the body without a perceptible neck. The fore limbs are modified into paddles, but, internally, they show bones corresponding to those in the arm of man, and not to those in the fins of fishes. The hind limbs are absent, but there is a distinct trace of the hip bones. The tail is expanded horizontally and not vertically as in the fishes. Most warm-blooded animals are kept warm by a hairy covering, the whales, however, are almost destitute of hair, but the body is surrounded by a very thick layer of fat or blubber under the skin to keep up the temperature. The whales wander over a wide part of the ocean, being found in tropical, temperate, and frigid seas. Their food is varied, that of the sperm whales being partly made of large cuttlefish. The ambergris of commerce is derived from an internal secretion coming from these whales, and containing the hard beaks of cuttlefish. The large whalebone whales feed on small crustacea, squids, fish, and the like. They swim with their mouths open, and when a number of these small creatures are collected within the mouth, it is closed and the water is strained through the plates of whalebones, while the animals are retained.•

The rorquals, from 65 to 75 feet long, are among the most abundant whales. The finback whale, about sixty feet long, is found along the coast of the eastern United States and is sometimes seen in Massachusetts bay. Another common whale of our eastern, Atlantic coast is the black whale or right whale, about forty feet long. It is occasionally found as far south as South Carolina. In the Arctic region is found the great bowhead, the most valuable of whales to the whale hunters, but not the largest one. It reaches a length of 50 to 60 feet, but an adult will yield from 200 to 300 barrels of oil and two tons of whalebone. The largest whale is the sulphur bottom of the Pacific, which reaches 100 feet in length, and is the largest of living animals and, probably, of all animals that have ever lived. The razorback of the north Atlantic grows to be seventy feet in length. The sperm whale, or cachalot, is a toothed whale, which attains a length of eighty feet. It inhabits the open sea, especially in southern latitudes. It yields the fine sperm oil and spermaceti. The chase of these monsters of the ocean has greatly declined, largely on account of their growing scarcity and the abundance of other oils. Formerly, New Bedford and San Francisco were the principal whaling ports of the United States.

What to Read. Boys and girls who pass their school days without having formed a taste for good books, either drop the reading of books altogether when they leave school or fall into the habit of reading trash. On the other hand, the youth who through wise supervision and guidance has been led to read along right lines and to appreciate good literature, has secured a possession, the value of which, both as a means of advancement and a source of highest enjoyment, is beyond price. Many regard the benefits to be derived from the companionship of books as open only to those who have the advantages of what is termed a liberal education. No greater mistake can be made. Says Dean Farrar: "Any one who simply knows how to read has in his hands a key which will admit him into the richest treasuries of human thought. He may so use the simple knowledge of his own language as to raise himself to an intellectual level with those who have enjoyed the amplest opportunities. The youth who has learnt to read with thoughtfulness and intelligence, who loves reading, and who knows what to read and how to read, has within his reach the best gifts that life can offer. He need never be dull, he need never be ignorant, he need never be unprogressive."

In view of considerations such as these, no problem is more worthy the thoughtful attention of parents than that which is presented in the wise direction of the reading of their children. The abundance of material which is available affords ample room for individual taste and judgment in the choice of books. In respect to mature readers, it is often claimed that no definite advice should be attempted in this direction, on the ground that restraint and guidance will interfere with the individual taste or natural bent of the mind, or that the reading of books which are not congenial to the reader is a waste of time. As to children, however, the need of guidance is evident. Here something may be learned from the methods which are pursued in respect to school studies. In the earlier years, studies are arranged without reference to the personal aptitudes or tastes of pupils. Certain branches are considered fundamental, and these they are required to pursue. It is well understood that their preferences cannot be followed. With maturing years, and with mental growth which results from the accomplishment of the tasks assigned them, comes the development of judgment and taste which can be made the basis of intelligent choice. Accordingly, in higher schools, while guidance is still deemed essential, and the curriculum is for the most part defined, yet the presence of a matured and developed taste in the student is recognized in the introduction of

optional courses, and finally, when the course has been finished, the hand and the mind of the instructor is withdrawn, and the taste and judgment of the individual become supreme in the choice of all future study and work in life. So in respect to reading, there should be at first close direction, and later such guidance and suggestion as may give room for the development of individual taste and preference.

A starting point is afforded in the love of the "story," which is universal among children. Fresh wholesome narrative comes earliest. The fairy and folk stories which have delighted many generations of children, here properly have place and serve a valuable purpose. No child should miss the delights of the inimitable *Wonder Stories* of Hans Christian Andersen, Kingsley's *Water Babies*, *Alice's Adventures in Wonderland*, Scudder's *Fables and Folk Stories*, and others of this class. These may be followed by the myths and legends of primitive ages, as found in Hawthorne's *Wonder Book*, and *Tanglewood Tales*, Kingsley's *Heroes*, and Cox's *Tales of Greece*.

There are many charming and instructive books relating to animal and bird life to which children should be introduced during the early years of their school life. A list of such books will be found under *Nature Study*, in the article PEDAGOGICS in this work. Books of voyages and travel early excite the interest of bright boys and girls and justly have an important place in the reading of the young; for while they hold the attention, they at the same time have a distinct educational value. They widen the horizon of the youth, and fill his mind with a rich store of facts. Here, however, there is need of caution. Of real travel, exploration, and discovery, there is little danger that too much will be read; but in the use of fictitious travel and adventure there is need of moderation and close scrutiny. A flood of stories of this class appear every year, which are untruthful, exaggerated in style, and unhealthy in sentiment. On the other hand, there is an abundant supply of books which are admirable in matter and style. A few of these, such as *Robinson Crusoe*, Dana's *Two Years before the Mast*, Bayard Taylor's *Boys of Other Countries*, the *Bodley Books*, Knox's *Boy Traveler Series*, may well be placed in the library of every youth. There is, however, danger in over indulgence in even the best books of this class. A fondness for fiction must ever be held in check, if a taste for reading of a more solid and enduring kind is to be developed. The explorations of Livingstone, Stanley, Baker, Du Chaillu, and others, and the history of American pioneers, afford not less interesting and far more profitable reading than even the best of fiction in the same line. Quite early the important fields of history and biography may be entered. Books like Guerber's *The Story of the Thirteen Colonies*, Johonnot's *Stories of Our Country*, Towle's *Biographies*, *Pizarro*, *Magellan*, etc., may be read with interest and profit by pupils in the fifth and sixth school grades. As supplementary to language work in school, children should be made familiar with some of the best literature in prose and poetry, choice being made of such selections as are marked by purity and simplicity of style.

The following brief list, in which are named books which are adapted to pupils in each of the grammar school grades, can readily be enlarged from the abundant material which is available. Many of these are issued in inexpensive form in the *Riverside Literature Series*.

FIRST GRADE.— *The Hiawatha Primer; Verse and Prose for Beginners; Æsop's Fables*, Vols. I. and II., Pratt.

SECOND GRADE.— *Fables and Folk Stories*, Scudder; *Hans Andersen's Stories; German Household Tales; Fifty Famous Stories Retold*, Baldwin; *Bird World*, Stickney-Hoffman.

THIRD GRADE.— *Stories of Colonial Children*, Pratt; *Wonder Book*, Hawthorne; *Legends of Norseland*, Pratt; *The Nine Worlds*, Litchfield; *Old Stories of the East*, Baldwin; *Old Greek Stories*, Baldwin.

FOURTH GRADE.— *Tanglewood Tales*, Hawthorne; *Stories from Old Germany*, Pratt; *Hiawatha*, Longfellow; *King of the Golden River*, Ruskin; *Old Greek Folk Stories*, Peabody.

FIFTH GRADE.— *Child Life in Poetry*, Whittier; *Children's Hour and Other Poems*, Longfellow; *Gulliver's Voyage to Lilliput*, Swift.

SIXTH GRADE.— *Courtship of Miles Standish*, Longfellow; *The Story of the Shad*, Church; *A Christmas Carol*, Dickens; *Enoch Arden*, Tennyson; *Birds and Bees*, Burroughs.

SEVENTH GRADE.— *Rip Van Winkle and Other Essays*, Irving; *The Story of the Æneid*, Church; *Snowbound and Other Poems*, Whittier; *Grandmother's Story of Bunker Hill and Other Poems*, Holmes; *Sharp Eyes and Other Papers*, Burroughs.

EIGHTH GRADE.— *Evangeline*, Longfellow; *My Hunt after the Captain and Other Papers*, Holmes; *The Vision of Sir Launfal*, Lowell; *Tales of the White Hills*, Hawthorne; *Thanatopsis and Other Poems*, Bryant; *Merchant of Venice*, Shakespeare; *Gettysburg Speech and Other Papers*, Lincoln; *Lays of Ancient Rome*, Macaulay; *Lady of the Lake*, Scott.

SUPPLEMENTARY MATERIAL IN GEOGRAPHY. — *Stories of Starland*, Proctor; *Our Own Country*, Smith; *North America*, Carpenter; *Story of Our Continent*, Shaler; *Hawaii and Its People*, Twomby; *Our American Neighbors*, Coe; *The South American Republics*, Warwick and Smith; *Boy Traveler Series*, Knox; *By Land and Sea*, Companion Series; *Persons and Places in Europe*, Benedict; *Modern Europe*, Coe; *Asia*, Carpenter; *Life*

in Asia, Badlam; *Australia and the Islands of the Sea*, Kellogg; *Australasia*, Pratt.

SUPPLEMENTARY MATERIAL IN HISTORY.—*American History Stories*, Pratt; *Beginners' American History*, Montgomery; *Primary History*, MacMaster; *Short Stories from English History*, Blaisdell; *Story of Our Country*, Burton; *Four Great Americans*, Baldwin; *Four American Patriots*, Burton; *Four American Naval Heroes*, Beebe; *Stories of American Life and Adventure*, Eggleston; *Colonial Massachusetts*, Dawes; *Pioneers of the Mississippi Valley*, McMurry; *Heroes of the Middle West*, Catherwood; *Story of the Thirteen Colonies*, Guerber; *Story of the Great Republic*, Guerber; *American Indian*, Starr; *George Washington*, Scudder; *War of Independence*, Fiske; *The Story of the Chosen People*, Guerber; *The Story of the Greeks*, Guerber; *The Story of the Romans*, Guerber.

High school students have reached a point when they should begin to consider for themselves what books they shall read, and to form some plan and purpose in their choice of books. Where needs and tastes are so variable, it is not practicable to map out courses of reading which shall be adapted to all readers. Some maxims, however, may well be considered:—

1. Let your reading have definite direction; do not be an aimless reader.

2. Do not read exclusively along one line; see that the best books in each of the departments of literature have due attention.

3. If you adopt a definite course of reading, let it be a brief one. Do not invite failure by undertaking more than you can accomplish.

4. Having formed your plan, go forward with it steadily to the end; let nothing divert you. "Putting the word *done* opposite a purpose is a wonderful incentive to a larger achievement in the next attempt."

5. Beware of the enticements of fiction. Let at least one-third of the books that you read be of the more solid kind — history, biography, essays, etc.

6. Read the old books — those that have stood the test of time and have taken rank as belonging to the world's best literature.

7. Read carefully, thoughtfully, and read over again some of the best books, especially those that have most interested you. Thus your own critical judgment will be developed and you will be fitted for progress in the art of reading. See the articles on LITERATURE, in this Cyclopædia.

Whate'ly, Richard, a British theologian, was born at London, Feb. 1, 1787. He studied at Oxford with honor, and remained there as tutor and afterward as Bampton lecturer. After having charge of a parish for two years, he returned to Oxford as principal of St. Alban's hall, and later was made professor of political economy. His appointment soon after as archbishop of Dublin, "a call to the helm of a crazy ship in a storm" as he called it, gave him work of a different kind, but he endowed the chair of political economy in Trinity college. During the Irish famine, he was unwearied in his efforts to help his people, and his charities were always on a large scale. His treatises on *Logic*, *Rhetoric*, and *Christian Evidences* his best-known works, were used for generations as text-books. His *Historic Doubts Relative to Napoleon* is also famous. He died Oct. 8, 1863. See *Life and Correspondence*, by his daughter.

Wheat, a species of Triticum (*T. sativum*), a genus of the grass family. It is not known in the wild state, but its original home is believed to have been in western Asia. It has been under cultivation throughout the entire time covered by human records. "Spelt" is a kind of wheat cultivated in some parts of Europe, in which the chaff adheres firmly to the grain, as in barley. In the wheat of ordinary cultivation, however, the chaff is easily removed by threshing. The numerous varieties are variously known as "spring" and "winter wheat," "bearded" and "beardless wheat," etc. Spring wheat is sown in early spring; while winter wheat is sown in the autumn. Wheat is one of the most valuable of cereals, and is the source of all the common white flour of the United States. In 1899, the wheat crop of the world amounted to 2,725,407,000 bushels, the United States leading all other nations with its production of 547,304,000 bushels. In the same year, the five states showing the largest yield were Minnesota, 68,223,581 bushels; North Dakota, 51,758,630 bushels; Ohio, 39,998,006 bushels; South Dakota, 37,728,339 bushels; and Kansas, 36,468,044 bushels.

Wheat'stone, Sir Charles, an English inventor and scholar, was born at Gloucester, England, in February, 1802. He began making musical instruments, and made many experiments in sound, inventing an instrument that was played by a piano in another room, and so seemed to play itself. His first paper was on *New Experiments in Sound*. He extended his studies to light and electricity, invented a number of instruments, and took out, with Cooke, a patent for an electric telegraph in 1837. He invented the stereoscope, the cryptograph, and a telegraph barometer and thermometer, by which an observer at the foot of a mountain could read the instruments at the top. Scarcely a year passed without a paper from him on some difficult scientific subject, or an invention. He was made professor in King's college, London, a fellow of the Royal society, a member of all the leading foreign scientific associations, and, after the completion of his automatic telegraph, was knighted. He died at Paris, while perfecting an instrument for submarine cables, Oct. 19, 1875.

Wheat'stone's Bridge, a piece of electrical apparatus devised by Sir Charles Wheatstone for measuring the electrical resistance of a conductor. It consists of a network of six wires arranged as shown in the accompanying diagram. Four resistances R, R_1, R_2, and X are joined in series so as to form a closed circuit. In this circuit there will always be four junctions, namely, A, D, B, and F. The next step in manufacturing a Wheatstone's bridge is to join a battery across two diagonally opposite junctions, say A and B, as

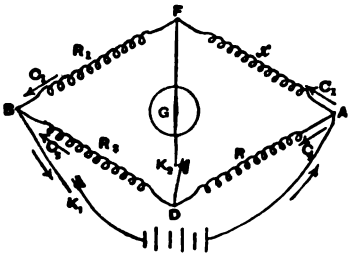


DIAGRAM OF WHEATSTONE'S BRIDGE.

shown is diagram. The current entering at A divides into two parts, one flowing along the branches X and R_1, the other flowing along the branches R and R_2.

Next join the remaining two junctions, F and D, by a circuit containing a galvanometer. In general, the potential at F and the potential at D will be different; but by diminishing the resistance in R and increasing the resistance in R_2, or vice versa, we can easily make the potentials at F and at D the same. When this adjustment is reached, there will be no current flowing through the galvanometer G even though the key K_2 be closed. Let us now call the fall in potential between A and F (and hence also between A and D) E_1; and the fall in potential between F and B we shall denote by E_2. Then, by Ohm's law, we may write

$$\frac{E_1}{X} = \frac{E_2}{R_1} \text{ and } \frac{E_1}{R} = \frac{E_2}{R_2}$$

Dividing one of these equations by the other we have

$$X = \left(\frac{R_1}{R_2}\right) R$$

Accordingly, if we know the value of one resistance R and the ratio of the other two, R_1 and R_2, we can obtain at once the value of the unknown resistance X. And this is the purpose of the Wheatstone bridge. See any good text-book of physics for a discussion of this subject.

Wheel, a piece of wood or metal, usually round and either solid or open, fastened to a center piece, around which it turns. The center piece is called an axle when the wheel turns on it, and an arbor or shaft when the wheel turns with it. Wheels are used to produce motion, and are of different kinds, as wagon wheels, water wheels, car wheels, steamboat wheels, fly wheels, balance wheels, crown wheels, spur wheels, band or belt wheels, ratchet wheels, cog wheels, and pinions, the kinds used in machinery. Carriage and wagon wheels are made of wood with a band of iron; car wheels and machinery wheels of iron, though sometimes of wood or brass; and clock and watch wheels of brass also. Carriage and wagon wheels are made with a central hub of wood, which turns on an axle, from which spokes radiate to the wooden rim of the wheel. An iron tire or hoop, heated hot, so that it expands, is fastened on the rim, and as it cools it tightens, connecting the parts very firmly. Car wheels are made either of iron or steel, or iron and steel, or of iron, steel, and wood combined, and are usually solid, with the edge or rim fitted to the rail. Water wheels are used for turning machinery by water. The overshot wheel has boxes or buckets on the rim. The buckets on one side fill with water and their weight makes the wheel turn, the buckets emptying themselves as they reach the bottom. The undershot wheel has flat boards called floats instead of buckets, and is used where there is plenty of water. The turbine wheel is one that works flat instead of up and down. In machinery, the sets of wheels are joined by bands or belts, or work by cogs or teeth. See WATCH, CLOCK, STEAMBOAT, etc.

Wheel'er, Joseph, American soldier, a distinguished cavalry general of the Confederate army and in command of the cavalry division of the United States army of Santiago in the war with Spain, was born at Augusta, Ga., Sept. 10, 1836, and graduated at West Point in 1859. In April, 1861, he entered the Confederate army and by the close of that year he rose to the rank of brigadier, and later to that of major-general and lieutenant-general. He was present at the battle of Shiloh, served under Bragg in the west, distinguished himself at Chickamauga, and opposed Sherman in his march through Georgia and South Carolina, and during the war was thrice wounded and had sixteen horses shot under him. In 1869, he settled at Wheeler, Ala., where he became a planter and lawyer, and in 1880 was returned to congress as a Democrat from Alabama, and served continuously until May, 1898, when he became major-general of volunteers, and was assigned to the command of the cavalry division in the army of Santiago. He was present at the battles of Las Guasimas and San Juan Hill, and was the senior member of

GENERAL WHEELER.

the commission to arrange for the surrender of Santiago de Cuba. During 1899, General Wheeler was on service in the Philippines, and in August, 1900, he retired from the United States army, having reached the age limit of sixty-four.

Wheel'er, William Almon, nineteenth Vice-president of the United States, was born at Malone, N. Y., in 1819. He began his political career as a state senator in 1858. In 1860, he was in congress, and again from 1866–77. The "compromise" which allayed the disturbed condition of politics in Louisiana in 1874 was largely his work, and he was also foremost in returning his back pay to the national treasury when the act increasing the salary of congressmen was passed. He was elected to the vice-presidency in 1876, when Hayes was President. He died June 4, 1887.

Wheel'ing, a city of West Virginia, in the narrow strip known as the Panhandle, on the Ohio river. Part of the city is built on an island in the river, connected with the mainland by a suspension bridge. It has the capitol building, used for government purposes while it was the capital of West Virginia, post office, customhouse, public library, opera house, and other fine buildings. It is chiefly known as a manufacturing city, the coal in the region furnishing an abundance of cheap fuel as well as natural gas, which is used in many factories. There are blast-furnaces, iron foundries and forges, and manufactories of mowing and reaping machines, steam engines, wagons, and carriages, nails, leather, and paper, besides extensive glass factories, potteries, and cigar factories. It was the capital of West Virginia until 1870, and again in 1875. Population 38,878.

Whelk, the name for marine Gasteropod mollusks belonging especially to the family Buccinidæ. The common whelk of the northern Atlantic is eaten in England. These animals look somewhat like very large snails. The shell is pointed, but has only a few whorls. The animal has a broad body, with tentacles projecting from the head. It can be entirely retracted within its shell. It burrows in the sand, and feeds on clams and other bivalve mollusks. Some whelks are used for bait.

Whig Party, The. (1) In British history, one of the two political parties in the state, of an advanced and reforming character, now known as Liberals; the term had its origin in the middle of the 17th century, and was applied to the Scotch Presbyterians (Covenanters, as opposed to the Cavaliers), who had rebelled against the crown; and thus the appellation was at first regarded as a contemptuous epithet, hurled at them by the Tory party—the organization opposed to them in the state, and that favored monarchy and conservative rule. The Whigs may be said to be the successors of the Cromwellian Roundheads, whose liberal principles led them to favor and defend the Revolution of 1688, insist upon parliamentary control of the government, and desire the Hanoverian rather than the Stuart rule. The influence of the party became powerful in the state from the era of George I. and was represented by the great Whig families of the time—Burke and Fox being its chief leaders. After the era of the Reform bill (1832), a piece of legislation brought about by the Whigs, the latter term began to be replaced by that of the progressive and reforming Liberals. Prof. Goldwin Smith thus defines the two party names (*United Kingdom*, Vol. II., p. 46.) "The Tory was the friend of government by prerogative and of church privilege; the Whig was the friend of constitutional liberty and toleration; in effect, the Tory was a supporter of monarchical, the Whig of parliamentary, supremacy. . . . In later times, the Tory party became that of political and ecclesiastical reaction, the Whig party that of general progress."

(2) In American history, the Whigs of the days of the American colonies were those who favored the Revolution, as opposed to the Tories, who advocated adherence to the mother country. The term more specifically dates, however, from about the year 1830, and refers to the political party in this country under the leadership of Henry Clay, known as National Republicans (or Whigs), as opposed to the Jackson, and later to the Democratic, Republicans. The Whigs favored a protective tariff, a national bank, with a system of internal improvements. It was they who, in 1840, elected W. H. Harrison to the presidency, and sought in 1844 to elect Clay to the office; but the latter was defeated by Polk. With the election of Zachary Taylor, the Whig party fell into a state of disintegration, many of the northern Whigs becoming "Free Soilers," and most southern Whigs becoming Democrats. The Whigs had a long line of representative leaders in the north; but the term fell into disuse, or, more correctly, gave place to that of Republicans—the last action of what remained of the Whig party being the nomination by the "Constitutional Union" party, in 1860, of Bell and Everett, at Baltimore, for the presidency and vice-presidency.

Whip'ple, Abraham, an American naval officer, was born at Providence, R. I., Sept. 16, 1733. He commanded a privateer in the French and Indian war, and in one cruise took twenty-three French prizes, and during the Revolutionary war his ship *Providence* took more vessels than any other in the service. After his ship was finally taken by the British, he sailed for France with dispatches in a new ship and encountered the British merchant fleet of 150 vessels on its way to Jamaica. Hiding his guns and running up the British flag, he joined the fleet,

and at night captured a vessel, putting on a crew from his own ship, and sent it to America. This he did until he had taken ten ships. He was taken prisoner near Charleston in 1780. His ship was the first American vessel to enter the Thames with the United States flag, in 1784. He moved west with the Ohio company, dying at Marietta, O., May 29, 1819.

Whip-poor-will, a bird widely known on account of its oft-repeated cry of *whip-poor-will*. It is not often seen, although it is abundant in damp woods of the eastern United States. It usually rests on the ground during the day and is active at twilight and early nightfall, sending forth its cry, and also coursing low over the grass in search of insects. It is about ten inches long and of plain colors, being grayish, much variegated with black and buff. Its bill is very broad, its mouth large and provided with a tuft of long bristles. It builds no nest, but deposits its eggs on leaves or a slight depression in the ground. To the same family belong the chuck-will's-widow and the night-hawk.

Whirl'pool is a current in a river, which moves in a circle, owing to opposite tides or winds. The two celebrated sea-whirlpools are Charybdis, near Sicily, and the Maelstrom, in the North sea, which are not usually dangerous to ships, but when the current and the wind are strongly opposed to each other, large ships are driven against the rocks. Whirlpools were dreaded by sailors and many legends arose about them. They were thought to be openings into great caverns, within whose depths lived mermaids and sea monsters, and the Norwegian fishermen still believe that if they can throw a heavy object into the whirlpool it will close up without injuring their ship.

Whirl'wind, a small vortex motion of the earth's atmosphere, generally produced by the meeting of two contrary winds.

Prof. R. W. Wood has shown a very neat method of producing artificial whirlwinds. He heats a large iron plate—say four feet square—by placing a number of Bunsen burners underneath. While the plate is hot a little sal ammoniac is scattered over it. The fumes thus produced render visible the vortices which are formed by the two currents of air coming over opposite edges of the hot plate. See STORM, and CYCLONE.

Whis'key, a spirit or liquor distilled usually from grain of some kind, originating probably among the Celtic inhabitants of Ireland and Scotland, as the name is from the Celtic, meaning "water of life." It was first known as "*aqua vitæ*" (water of life) and used only as a medicine, and was first used as a drink in Scotland in the 17th century. The tax on whiskey was imposed partly for revenue, but largely to reduce its use, but resulted in evasions of the tax by illegal manufacture and smuggling. Whiskey was first made from malted barley by distillation (which see), but can be made from any grain, or even from potato starch or grape sugar. In the United States, it is made largely from corn and rye. A great deal of whiskey is made into alcohol, gin, and French brandy. Whiskey is nearly colorless when made, but grows red from the wood of the barrels in which it is kept, which are usually charred to help to darken it. It is improved by age. Nearly 39,000,000 gallons a year are made in Great Britain, of which over 26,000,000 are used there. In the United States, the tax on whiskey is one of the greatest sources of revenue to the government, and about 80,000,000 gallons a year are manufactured.

Whistler (*hwis'ler*), **James Abbott McNeill,** a brilliant Anglo-American painter, etcher, and author, was born at Lowell, Mass., in 1834, and educated at West Point at the United States Military academy. He studied art at Paris and settled at London, England, where he became president of the British Society of Artists, and held exhibitions of his pictures in the British metropolis. There is a strain of the erratic in his mental composition, which has more than once brought him into antagonism with art critics—notably with Ruskin; but he has genius and gifts of a high order in the impressionist school and has attained eminence as an etcher and colorist. Some of his more important paintings include what he terms *Nocturne in Blue and Gold*, arrangements in black, gray, and green; his *Portrait of My Mother* is excellent, as are *The White Girl*, and *The Last of Old Westminster*. He has also done good work in the painting of the portraits of some celebrities, and is, moreover, the author of that amusing human document, *The Gentle Art of Making Enemies*. His other published works include *Ten O'clock*, *Four Masters of Etching*, and *The Baronet and the Butterfly*.

JAMES ABBOTT M'NEILL WHISTLER.

Whit'by, a seaport in Yorkshire, England, on the North sea, at the mouth of the Esk river. The old town has narrow, steep, irregular streets, while the new part has all the features of the fashionable watering-place. The old abbey is in ruins, but Whitby hall has been restored. The parish church stands on a cliff 350 feet high, with a flight of nearly 200 steps. The piers run out about 1,000 feet in the ocean. The chief exports are jet ornaments and iron, the jet being obtained from a kind of petrified wood peculiar to the re-

gion. The herring fishery is increasing, but the shipping trade, which was large when the vessels for Captain Cook's voyages were built here, has declined, and the town is gradually becoming merely a watering-place. Population 15,274.

Whitby (Whitetown) was originally the seat of a monastery, built by Oswy, king of Northumbria, in 658. The convent connected with it was in charge of the abbess Hilda and became famous. Destroyed by the Danes in 867, it was restored in 1074.

White, Andrew Dickson, American educator and diplomat, was born at Homer, N. Y. Nov. 7, 1832, and after graduating at Yale traveled and studied in France, and became an attaché to the United States legation at St. Petersburg. In 1857, he was appointed professor of history and English literature at the University of Michigan, and ten years later became president of Cornell university, a post which he held until 1885, contributing from his own means to it $100,000, part of which was applied to the equipment of the library of the school of history and political science at Cornell. In 1871, he was appointed one of the United States commissioners to Santo Domingo; in 1878, was commissioner to the Paris exposition from the state of New York; and from 1879 to 1881 was United States minister to Russia (serving also in that post during the years 1892–94). In 1897, he was named by President McKinley ambassador of the United States to Berlin, a post he continues still to hold. Dr. White is a regent of the Smithsonian institution at Washington and has been president of the American Historical society and of the American Social Science association. He is the author of *Lectures on Mediæval and Modern History*, *The New Germany*, *The Warfare of Science*, *History of the Warfare of Science with Theology*, *European Schools of History*, and *Studies in General History*.

ANDREW DICKSON WHITE.

White, Edward Douglass, associate-justice United States supreme court, was born in the parish of Lafourche, La., Nov. 3, 1845, and was educated at the Jesuit college of New Orleans and at Georgetown (D. C.) college. He served in the Confederate army during the Civil war, was admitted to the Louisiana bar, and in 1874 was a state senator. From 1878 to 1891, he sat as associate-justice of the supreme court of Louisiana, and from 1891 to 1894 was a member of the United States Senate. In February, 1894, he was appointed associate-justice of the United States supreme court. In politics, he is a Democrat.

White, Henry Kirke, an English poet, was born March 21, 1785, at Nottingham, England. His mother's ambition led to his being educated as a lawyer, instead of following his father's business. His first poems, published in the *Monthly Mirror*, attracted the attention of the owner of the paper, who advised their publication in book form. The volume was cruelly treated by the critics, but brought him the friendship of Southey, and a scholarship at Cambridge. He is best known by his hymn *The Star of Bethlehem*. He died while at college, Oct. 16, 1806, when only twenty-one years old. His poems were published by Southey, with a memoir, which attracted public attention and sympathy.

White, Richard Grant, an American author, was born at New York city in 1822. Though a student of medicine and of law, he adopted a literary career, being for fourteen years on the *Courier and Enquirer* of New York, part of the time as editor. The result of his studies and writings on music and art was a volume on *Christian Art*, published in 1853. Other works are *National Hymns*, published during the war, *Poetry of the Civil War*, *Words and Their Uses*, and *Every-Day English*. Among his best-known articles to the magazines, to which he contributed for thirty years, were those on the plays of Shakespeare. He died at New York, April 8, 1885.

White Ant. See ANT.

White'bait, a name given in London to the translucent young of the herring and other similar fishes. They are salt-water fishes, but come up the Thames with the tide. Whitebait dinners are stylish and famous. The name is also given to small colorless fishes living at considerable depths off the coast of China and Japan, but approaching the shores to spawn in their season. They are considered a delicacy by English people living in China.

White'fish, a common name for a number of fishes of pale or white color belonging to the salmon family. They are inhabitants mostly of the lakes in the northern hemisphere. The name applies especially to the common whitefish of the great lakes. This is the largest of the group, reaching a length of about 30 inches. It varies in appearance with age and condition. It ranges from the region of the great lakes north to the Arctic circle. It feeds on small crustacea, insects, and minute organisms in the water. It is one of the finest food fishes of America. The whiting is a slimmer and smaller variety of whitefish. The smallest and handsomest of the American whitefishes is the lake herring, or cisco, a slender fish from ten to fifteen

inches long. In Europe, the name whitefish is given to any fish with silvery scales and without spots.

White House, the residence of the President of the United States, at Washington. It is a mile and a half from the capitol, on Pennsylvania avenue. The corner stone was laid in 1792, and President John Adams was

WHITE HOUSE, OR EXECUTIVE MANSION.

the first to occupy it in 1800. In 1814, it was burned by the British, and rebuilt and occupied again in 1818. The grounds cover about 75 acres, 20 acres being inclosed as private grounds. It is built of freestone, painted white, 170 feet long by 86 feet deep, with a circular porch in the rear, and a colonnade in front. The architect was an Irishman, and the house is modeled after the duke of Leinster's palace at Dublin.

White Lady, a being who, according to German legend, appears in snow-white garments with a bunch of keys at her girdle, and sometimes watches over sleeping children. Bertha of Rosenberg, in Bohemia, is one of the most famous of these appearances, and Sir Walter Scott's *White Lady of Avenel* is also celebrated. See *Curious Myths of the Middle Ages*, by S. Baring-Gould.

White Lead is one of the compounds of lead, called by chemists basic carbonate of lead, and is used extensively in the manufacture of paint. The Dutch process of manufacture is the oldest. Thin sheets of lead are rolled up and put into earthen vessels, which have some weak vinegar at the bottom. These vessels are surrounded with spent tan bark or some other material which ferments readily, and thus produces heat and gives off carbon dioxide. The pots are thus left for about six weeks, when the lead is found either thickly coated or entirely changed into the white basic carbonate of lead. This process is thought to give the best material for fine work, and is used in some of the American white lead factories, but the patent process manufactures it more cheaply. There are thirty-six white lead factories in the United States, the largest being at Brooklyn, and the product is 70,000 tons a year. The lead used is brought from the Rocky mountain region.

White Mountains, a chain of mountains in New England, commencing with Mt. Katahdin on the Aroostook river, Maine, and crossing New Hampshire. It has twenty high peaks in New Hampshire, the highest, Mt. Washington, 6,288 feet. Mount Pleasant, Franklin, Monroe, Jefferson, Adams, Madison, and Lafayette are other summits. Mt. Washington is the highest point in New England and is a favorite summer resort, with a hotel on its summit. The first mountain railroad in the world was built up this peak in 1868. The White Mountain Notch, the Franconia Notch, and others are natural openings through which the rivers and railroads pass. At Franconia Notch is the famous stone profile, forty feet high, called the "Old Man of the Mountains," and Profile lake, known as the "Old Man's Washbowl."

White Plains, a town of New York, twenty-five miles northeast of New York city. During the war, in October, 1776, it was held by Washington, while General Howe tried to get around the American army on Manhattan island. There were several skirmishes, but Washington held the high ground above White Plains until November 5, when Howe moved to Dobbs Ferry and Washington began sending his troops into New Jersey. White Plains is in Westchester county, N. Y., and has a population to-day of 7,869.

White River, a river of the United States, which rises in the Ozark mountains, flowing through Missouri and Arkansas into the Mississippi, which it enters near the mouth of the Arkansas river. It is 800 miles long, and is navigable for 350 miles.

White Sea, a great bay of the Arctic ocean on the northern coast of Russia. It pierces the land for 350 miles, beginning with a width of 100 miles and narrowing to thirty-five miles. It then sweeps south for 200 miles, and widening forms the gulfs of Kandalak, Onega, and Archangel. Its coast line is about 1,000 miles long, and it covers about 47,000 square miles. Ice forms after August thirty miles out and does not melt till July.

Whitefield (*hwit'fēld*), **George,** an English preacher and reformer, was born at Gloucester, England, Dec. 16, 1714. While at Pembroke college, Oxford, he became associated with Wesley and his band of followers, who were already known as Methodists, and even among them was remarkable for his zeal, as shown in his labors in the jails. He preached his first sermon at Gloucester cathedral, where the earnestness and eloquence of his oratory produced a great impression. Five persons are said to have gone crazy with excitement, but when complaint was made to the bishop he said he hoped "the madness

would last till next Sunday." The same excitement attended his preaching in London, where the streets were filled in the early morning with persons carrying lanterns on their way to hear him preach, hours before the time of service. The clergy of the English church were offended at Whitefield's open air preaching, which he soon used almost entirely, owing to their unwillingness to open their churches to him. He and Wesley separated on doctrinal points, and Whitefield's supporters, led by Lady Huntingdon, built him a large shed called the Tabernacle, where immense crowds gathered. He paid seven visits to America, some of them lasting two or three years, where he preached to as large crowds as in England and Scotland, 20,000 persons hearing him at one time on Boston Common. His health failing, he put himself on what he called "short allowance," one sermon a day and three on Sunday. He died on his last visit to America, at Newburyport, Mass., Sept. 30, 1770. See WESLEY. See *Life*, by Tyerman; *Life and Times*, by Philip, and Lecky's *History of England*, Vol. II.

Whit'man, Walt, was born at West Hills, Long Island, N. Y., in 1819. As a young man he was a school teacher, printer, editor, and builder. His early verses attracted little or no attention, but his *Leaves of Grass*, published in 1855, at once made him one of the widest read of American poets. In the pieces which made up this book, an irregular rhythm took the place of rhyme and measure. In this he but followed Matthew Arnold's *Strayed Reveller*, the old Anglo-Saxon poem *Beowulf*, etc. Whitman is variously called by his admirers, "the poet of democracy" and the "good gray poet." Says Professor Beers: "He liked the people — multitudes of people; the swarm of life beheld from a Broadway omnibus or a Brooklyn ferryboat. The rowdy and the negro truck-driver were closer to his sympathy than the gentleman and the scholar." Whitman himself said, "I sound my barbaric yawp over the roofs of the world." During the Civil war he gave himself up to the care of the wounded soldiers in the Washington hospitals, and about this experience he wrote his *Dresser*. In his *Drum Taps*, a volume of poems on the Civil war, is one of his finest pieces, *My Captain*, written after the assassination of Abraham Lincoln. In 1888, appeared his last volume, *November Boughs*. Whitman made his home in the latter part of his life at Camden, N. J., where he died March 26, 1892. See *Poets of America*, by E. C. Stedman.

WALT WHITMAN.

Whit'ney, Eli, an American inventor, was born at Westborough, Mass., Dec. 8, 1765. He worked his way through Yale college, where he graduated in 1792, and then taught school and studied law. The great want of the south was a machine to separate the cotton from the seed, a very slow and expensive process by hand. At the desire of his neighbors, Whitney in 1793 invented his famous cotton or saw gin, which was the foundation of the wealth of the Gulf states. He worked under great disadvantages, as he had to make his own tools and even the wire for the hopper. For a description of the cotton gin, see COTTON. Like many other valuable inventions, this one was stolen by some one who broke into his workshop before he had time to get a patent. Though South Carolina voted him $50,000, this sum was spent in useless lawsuits. Whitney, however, made a fortune in the manufacture of fire arms at Whitneyville, Conn. He died at New Haven, Conn., Jan. 8, 1825.

ELI WHITNEY.

Whit'ney, William Collins, was born at Conway, Mass., July 15, 1841. He studied at Williston academy, at Easthampton, Mass., and graduated at Yale college in 1863. He next studied law, began to practice in New York in 1865, and soon had a large business. His father, Gen. James S. Whitney, was a prominent Democrat, and Whitney became also interested in politics in New York city. In 1885 he became secretary of the navy in President Cleveland's cabinet. During his term of office new vessels were added to the navy, and Mr. Whitney is regarded as having been an especially able secretary. He is now living in New York city.

Whit'ney, William Dwight, American philologist, and brother of J. D. Whitney, the distinguished geologist, was born at Northampton, Mass., Feb. 9, 1827, and died at New Haven, Conn., June 7, 1894. In 1845, he graduated from Williams college, and was for several years employed in a bank at Northampton, meanwhile studying Sanskrit and other languages there, at New Haven, and later at Berlin. In 1853 he was appointed professor of Sanskrit at Yale, and in 1870 had added to his chair that of comparative philology in the same institution. Professor Whitney gained a European as well as national fame as a linguist and expositor of the science of language. His published works

include, besides a *German Grammar and Reader*, and a *Grammar of Sanskrit*, a work on the *Life and Growth of Languages*. He was also editor-in-chief of the *Century Dictionary of the English Language*, completed in 1891. He was president of the American Oriental society, and first president of the American Philological association.

Whit'tier, John Greenleaf, the Quaker poet, was born at a farmhouse near Haverhill, Mass., Dec. 17, 1807. Here and at the neighboring town of Amesbury most of his life was spent. He was a farmer's boy, and all the schooling he received was at the district school, with two years at the Haverhill academy. A copy of Burns awoke a desire to write, and he began to send verses to Garrison's *Free Press* and the local newspaper. For a short time he was editor of the *Manufacturer* at Boston, and for a year and a half edited George D. Prentice's paper, the *New England Weekly Review*, at Hartford. At Hartford, he published, in 1831, his first volume of verses—*Legends of New England*. Whittier was back in Haverhill, engaged in farming, when the antislavery movement

JOHN GREENLEAF WHITTIER.

began, into which he threw himself with the greatest enthusiasm. In 1833, he published a prose tract against slavery; he helped to found the American Antislavery society at Philadelphia, and became the poet of the movement, writing for it his *Voices of Freedom* in 1849 and his *Ichabod*. In 1838–39, he edited the *Pennsylvania Freeman* at Philadelphia, where his office was sacked and burned by a mob. *Laus Deo* was his last poem of freedom, written on hearing the bells ring for the passage of the constitutional amendment abolishing slavery. His chief works are *Maud Muller*, *Home Ballads and Poems*, *Miriam*, *National Lyrics*, *Poems of Nature*, *Among the Hills*, *In War Time*, and *Ballads of New England*. Among Whittier's larger poems are *Snow-Bound*, *The Bridal of Pennacook*, and *The Tent on the Beach*. He died Sept. 7, 1892. See *Poets of America*, by E. C. Stedman, and *American Literature*, by Henry A. Beers.

Whit'tington, Sir **Richard,** was born at Pauntley, Gloucestershire, England, about 1350. According to the well-known story, his father died when Richard was ten years old, and he tramped to London, where he became a merchant's apprentice. At one time he started to run away from his master, but while seated at the foot of Highgate hill seemed to hear in a chime of bells—

"Turn again, Whittington,
Thrice lord mayor of London town."

He did so; married his master's daughter, and became wealthy, his first stroke of business having been to send a cat to an eastern market; was lord mayor of London in 1397, and made loans to Henry IV. and Henry V. Whittington died in 1423.

Wichita (*wich'i-tâ*), the third city of Kansas, on the Arkansas river, in the midst of a very fertile region. It has 60 miles of street-car lines; factories and packing houses employing 1,500 workmen, and six railroads. There are good public schools, a high school, a medical college, Lewis academy, Fairmount college, and Wichita university. Its growth has been very fast. In 1870, not an inhabitant was on the site of Wichita; in 1880, the population was 4,911; in 1900, 25,625.

Wieland (*vē'lant*), **Christopher Martin,** a German poet and novelist, was born at Oberholzheim, Swabia, Germany, Sept. 5, 1733. He was carefully taught by his father, a clergyman. In 1750, he went to the University of Tübingen, where he devoted himself a little to law and very much to literature, and wrote his poem on the *Nature of Things*. After some years spent in Switzerland, where he supported himself by tutoring, and wrote a number of poems and plays, he settled in 1760 at Biberach as director of the chancery. From 1769 to 1772 he was professor of philosophy at Erfurt, after which he made his home at Weimar. Here he tutored, and also edited a monthly magazine, writing for it an immense number of poems and articles. His *Oberon* is held to be the best of his works. Wieland's romances were highly popular, and have not yet been surpassed in Germany. To him also belongs the merit of having first suggested to his countrymen that it might be worth while to study their own literature, as well as that of France, England, and Italy. He died at Weimar, Jan. 20, 1813.

Wiesbaden (*vēs-bä'den*), a fashionable watering-place of Prussia, stands on the slopes of Mount Taunus, five miles north of Mainz, and three miles from the Rhine. Its prosperity is entirely owing to its hot springs, and it is filled with hotels, lodging houses, villas, bath houses, and promenades for the

benefit of its 60,000 yearly visitors. The main buildings are the palace, the Cursaal, the five-towered Protestant church, the Roman Catholic church, the museum with a picture gallery and a library of 70,000 volumes, and the synagogue built in Moorish style. The chief spring is the Kochbrunnen, the waters of which are drank, besides which there are twenty-eight other springs used for bathing. These springs were known to the Romans, who fortified the place. Population 74,133.

Wigan (*wig'an*), a city of Lancashire, England, on the Douglas river, eighteen miles northwest of Manchester, and the same distance northeast of Liverpool. It is joined by rail and canal with these cities and with London. The main buildings are All-Saints' church, the royal Albert Edward infirmary and dispensary, the arcade, public library, and public baths. A park covering 27 acres was opened in 1878. The growth of the city is largely owing to its coal mines, which give employment to a large part of the people, and furnish cheap fuel for its cotton and iron mills. Wigan was a Roman station and later a Danish town. Three battles were fought there during the civil war, in the era of Charles I. and the Commonwealth. Population 59,000.

Wight, Isle of, a small island in the English channel, off the coast of Hampshire, separated from the mainland by a narrow strait, the Solent, and Spithead. It is 23 miles long and 13 miles broad, and covers about 145 square miles. High chalk downs cross the center of the island from east to west. Along the south coast is the Undercliff, a district noted for its wild scenery and mild climate, where a large hospital has been built. The isle has long been a favorite place for tourists, and there are fashionable watering places at Cowes, Ryde, etc. Farming, sheep raising, shipbuilding, and cement making are carried on. Vespasian conquered the Celts of the Isle of Wight in 43. From the time of Henry VII. it was ruled by a royal captain or governor. Charles I. was imprisoned in Carisbrooke castle, a fine old ruin, the inner walls of which were built in the 11th century. Near Brading are the remains of a Roman villa. Population 85,718.

Wilberforce, William, an English philanthropist, was born at Hull, England, Aug. 24, 1759. He attended Cambridge university and in 1780 was elected to the house of commons, where he became a friend of Pitt. In 1787, he first began to stir up opinion against the slave trade, in which he was seconded by his friends Pitt and Thomas Clarkson. Clarkson carried on the work in the country, while Wilberforce endeavored to gain over the the house of commons. By 1789, he succeeded in getting the subject before the house, but the friends of the planters were too strong, and the matter was postponed. In 1791, he brought it to a vote, but the motion for abolition was lost. He never ceased his efforts, but it was not till 1807, a year after Pitt's death, that the first great step toward doing away with slavery was taken, and it was not till a month after his own death that the emancipation bill, which owed so much to his efforts, was passed. Wilberforce also had a leading part in religious measures in parliament and religious work out of it. He died July 29, 1833, and was buried in Westminster Abbey, where a monument has been set up to his memory. See *Life*, by his sons.

Wilhelmina (*wil-hĕl-mē'na*), **Helena Pauline Maria,** queen of the Netherlands, was born at The Hague, Holland, Aug. 31, 1880, and is the only child of the late King William III. and of his second wife Princess Emma, daughter of Prince George Victor of Waldeck. She succeeded to the throne of the Netherlands on the death of her father, Nov. 23, 1890, though she only came of legal age eight years later (1898) when she was inaugurated as queen. On Feb. 7, 1901, she married Prince Henry, youngest son of the late grand-duke of Mecklenburg-Schwerin. Queen Wilhelmina is the fourth in the list of sovereigns of the Netherlands of the house of Orange since the reconstruction of the kingdom by the congress of Vienna (1814–15). Her Majesty is known to possess simple tastes, is an accomplished linguist, and an experienced horsewoman.

Wilkes, Charles, an American naval officer, was born at New York in 1801. At fifteen he entered the navy. In 1826, he was made lieutenant, and four years later was attached to the depot of charts and instruments at Washington. Here he made the first astronomical observations in America. In 1838, he was given command of a squadron of six ships, with which he surveyed the Samoan islands, discovered other Pacific islands and the Antarctic continent, and explored the Fiji islands. On coming back to Washington he published his *Narrative of the United States Exploring Expedition*, and was made a commander. In 1861, as captain of the United States steamer *San Jacinto*, he seized the Confederate commissioners to England — Mason and Slidell — on board the British steamer *Trent*, and carried them to Boston. This was the *Trent Affair* between the United States and England, and resulted in the commissioners being set free. In 1862, Captain Wilkes was made commodore. He died at Washington, D. C., Feb. 8, 1877.

Wilkesbarre, a city of Pennsylvania, on the north branch of the Susquehanna river, in the Wyoming valley, ninety-eight miles northwest of Philadelphia. The city is built partly on the bottom lands and partly on the surrounding hills. It is entered by four railroads. Wilkesbarre is in the midst of a great coal mining district, and is a center for mining supplies, and for coal shipment, besides having important manufactures of locomo-

tives, leather goods, lace, cutlery, wire rope, and steel, as well as foundries, breweries, and silk mills. Wilkesbarre was settled in 1770, but eight years afterward the whole region was laid waste by the Wyoming massacre (which see), the town being sacked and burnt. The same year a fort was built and the town rebuilt. Its growth is mainly since 1855. Population 51,721.

Wil'kie, Sir **David,** a Scottish painter, was born at Cults, Fifeshire, Scotland, Nov. 18, 1785. His father, who was a clergyman, placed him in 1799 in the Edinburgh academy, where he gained a prize for his *Callisto in the Bath of Diana.* He settled at London in 1805. In 1836, he was knighted. In 1840, he painted the portrait of the sultan, and made a trip to Palestine; and as he was returning to England, he died at sea, June 1, 1841. Among his best pictures are *Blindman's Buff, Guess My Name,* and *Reading the Will.* See his *Life,* by Allan Cunningham.

Wil'kins, Mary Eleanor, American authoress, was born at Randolph, Mass., in 1862, and has written largely on New England life. Her chief works, besides poems, short stories, etc., contributed to magazines, embrace: *Pembroke; Jane Field; A Humble Romance; A New England Nun; A Pot of Honey; Jerome, a Poor Young Man; Giles Corey, Yeoman; The Adventures of Ann;* and *Young Lucretia, and other Stories.*

Wil'kinsburg, Pa., a borough of Allegheny county, seven miles east of Pittsburg, and closely identified with the latter's business and civic interests. Its industries are chiefly those appertaining to coal mining. It has nearly trebled its population in the past decade, its present inhabitants numbering 11,886.

Willamette (*wil-ăm'met*) **River,** the main branch of the Columbia, west of the Cascade mountains, is formed near Eugene City by the junction of three streams which rise in the Cascade range. It flows north 155 miles, and falls into the Columbia 110 miles from its mouth. It is navigable for 126 miles above Portland for steamboats. Locks have been built around the falls at Oregon city at a cost of $450,000. The chief city on its banks is Portland, and the Willamette valley is the most thickly settled of any part of Oregon.

Wil'lard, Frances Elizabeth, noted for her temperance work, was born near Rochester, N. Y., in 1839. After attending the Milwaukee and Northwestern seminaries, she became a teacher and a writer for several magazines and papers. After two years spent in European travel, she was appointed in 1871 president of the woman's college of Evanston, Ill. She was very active in religious and temperance work, helping Mr. Moody in his meetings, and being made the first secretary of the Woman's Christian Temperance union, of which she was president from 1879 until her death, at New York, Feb. 18, 1898.

FRANCES E. WILLARD.

Will'iam I., the Conqueror, the son of Robert, duke of Normandy, was born in 1027 or 1028, and became duke in 1035. His guardians had to fight to make good his claim to the dukedom, and more than once his life was in danger. On visiting England, where Edward the Confessor then reigned, William found Norman influence strong at Edward's court, and felt sure that the crown would pass to him, but the Witenagemote chose Harold as king, ignoring William's claims. The Conqueror at once invaded England, and won the battle of Hastings and the throne, Oct. 14, 1066. He at first ruled the conquered Saxons mildly, but an uprising in 1070 was savagely put down, and the hatred between Saxon and Norman thereby aroused forced him to rule harshly. The Saxons were deprived of office, and ground down by taxes, while fortresses garrisoned by Normans were built throughout the country. In 1072, Scotland was invaded and King Malcolm Canmore forced to acknowledge William's authority. A civil war with his son Robert was ended through the intercession of Queen Matilda. Most of the latter part of William's life was spent in Normandy, the government of England being intrusted to his half-brother, Bishop Odo. William was rather fat, and a sarcastic remark made about this by Philip I. of France caused William to raise an army and invade France. He captured and set fire to Mantes, but while watching the blaze he was thrown from his horse, and died Sept. 9, 1087. Not only was William a successful soldier, but he knew how to rule, and England had never before been so well governed. See Freeman's *History of the Norman Conquest.*

Will'iam II., king of England, surnamed Rufus, the second son of William the Conqueror, was born in Normandy in 1056. The celebrated Archbishop Lanfranc was his teacher, and he was his father's favorite son. He had no sooner been crowned, Sept. 26, 1087, than his elder brother Robert, who had inherited Normandy, tried to stir up an insurrection in England. In return, William invaded Normandy in 1091. When a peace had been patched up between them, they joined arms against their third brother Henry, and drove him from Cotentin, a district covering

a third of Normandy, which he had bought from Robert. These scenes of strife were carried on throughout William's reign. He invaded Scotland, waged a second war against Robert and was engaged in putting down disturbances in Wales and the north of England. Robert, on leaving for the crusades, sold Normandy to his brother for $50,000. William Rufus' last campaign was in defense of a part of his newly acquired possession, the district of Maine, which was claimed by a chieftain named Helias de la Flèche. He was shot accidentally by an arrow as supposed to have come from the bow of Sir Walter Tyrrel while hunting in the New Forest, Aug. 2, 1100. See Freeman's *Reign of William Rufus.*

Will'iam III., king of England, the son of William II. of Orange, and Mary, eldest daughter of Charles I. of England, was born in 1650. Cromwell had the young prince shut out from the stadtholdership of the united provinces, but on the murder of De-Witt, William, then twenty-two years old, was chosen stadtholder. He found the republic in the midst of a hopeless struggle with Louis XIV., but by his ability as a general and by his skill as a diplomat, at the end of seven years he won an honorable peace by the treaty of Nimeguen in 1678. This achievement made him famous throughout Europe. By an alliance, formed at Augsburg in 1686, William became the head of a league of German princes, including Spain and Sweden, against Louis XIV. William had married Mary, the eldest daughter of James II., and to escape that monarch's tyranny the English now looked to the stadtholder as their only hope. He had but to land, Nov. 5, 1688, to bring the whole country to his support, and William and Mary were crowned joint sovereigns. Ireland, however, did not submit until after a two years' contest, and throughout William's reign, plots were hatched against his life by the followers of the Stuarts. The league, now strengthened by the addition of England, carried on vigorously its war with France, but the English people were never heartily in favor of it, and William was forced by home pressure and defeats in the field to make the peace of Ryswick in 1697. His reign in England was one of great progress in real liberty for the English people, and William is acknowledged to have been one of the ablest of English kings. He died March 8, 1702. See Macaulay's *History of England.*

Will'iam IV., king of England, the third son of George III., was born at Windsor, Aug. 21, 1765. When fourteen years old he was sent to sea as a midshipman under Admiral Digby. Next year he sailed under Admiral Rodney, and took part in the action off Cape St. Vincent. During the rest of the war the prince saw plenty of service. In 1789, he was made duke of Clarence. He joined his brothers, the prince of Wales and duke of York, in their opposition to the king, and took his seat in the house of lords. In 1827, on the death of the duke of York, William became heir to the throne, and was crowned king June 28, 1830. The great event of his reign was the passage of the reform bill, June 4, 1832. He died June 20, 1837.

Will'iam I., king of Prussia, and German emperor, was the second son of Frederick William III. of Prussia. He was born at Berlin, March 22, 1797. Though a delicate child, he became one of the most vigorous men in Germany. Made a captain in 1813, he accompanied his father in the campaign of 1814, and the next year was given the iron cross for his bravery at Bar-sur-Aube. When twenty-one he was made major-general, and mastered the military system of his own and other European countries. On the accession of his brother Frederick William IV. in 1840, he became heir to the throne, and was made prince of Prussia. At the outbreak of the revolutionary movement, in 1848, William saw that some of the demands for a freer government must be granted, but urged that order should first be restored. At this time he was the best hated man in Germany. In 1849, he skillfully crushed the rebellion in the grand-duchy of Baden, at which time an attempt was made upon his life.

On Jan. 2, 1861, he became king of Prussia as William I. The successful wars against Denmark and Austria changed the feelings of his subjects toward him, and on his return to Berlin he was received with unbounded enthusiasm, being looked upon from this time as the father of his people. On the outbreak of the war with France, in 1870, all Germans rallied round the king of Prussia, and when he quitted Berlin to join his army, he knew he had the support of a united nation. He personally commanded at the battles of Gravelotte and Sedan, and during the siege of Paris was proclaimed German emperor, Jan. 18, 1871. He left the destinies of Germany almost entirely in the hands of Bismarck, the chancellor of the empire. William I. died at Berlin, March 9, 1888.

Will'iam II., emperor of Germany and king of Prussia, is the eldest son of Emperor Frederick III. of Germany. He was born Jan. 27, 1859. After being tutored at home, he entered the Cassel gymnasium, where he was graduated in 1877. He then took a course under the professors of the Potsdam Military academy, and was made a colonel of hussars. On the death of Frederick, William II. became emperor June 15, 1888. He at once went back to the policy of William I. and Prince Bismarck, much to the disappointment of the great body of the nation, who had looked forward to enjoying the more liberal government which it was felt Emperor Frederick would have given Germany had he lived. The chief events of William's reign have been the forced retirement from office of the chancellor, Prince Bismarck, the

most powerful of his subjects, owing to their disagreements as to measures to be adopted toward the socialists, who are fast becoming one of the most powerful of the political parties of Germany; the widening of Germany's colonial empire; the interest taken by the empire in the punitive expedition to China (General von Waldersee in command) after the attack on the Legations at Pekin; and the struggle in the reichstag over the increase of the army, deemed necessary by the emperor in view of the state of Europe.

EMPEROR WILLIAM II.

Will'iam, prince of Orange, called "William the Silent," founder of the independence of the Netherlands, was born at Dillenburg, Nassau, April 16, 1533. He inherited Nassau from his father, and Orange from a cousin. As a boy he was a page at the court of Charles V., who gave him the command of a body of troops and employed him in diplomacy. When Philip II. left for Spain he appointed William one of the state council to help Margaret of Parma to rule the Netherlands as regent. He opposed the persecution of the Protestants, and refused to permit it in the provinces of which he was stadtholder. When the duke of Alva marched to Brussels and put to death Egmont and Horn, William, who had fled to Germany, had his property seized and his son sent to Spain as a hostage. After raising an army he marched against Alva, but was forced to retire to French Flanders, and with his brothers Louis and Henry joined the Huguenots under Coligny. In 1569, he sent out privateers, known as the "beggers of the sea," which captured Briel in 1572. This exploit was followed by the rebellions of Flushing, Haarlem, Dort, Leyden, and other cities, which acknowledged William of Orange as their prince. William and his brother captured several other towns, but the massacre of St. Bartholomew destroyed his hopes of French aid, and he was forced to disband his army. The Spaniards retook city after city, sacked Haarlem after a seven months' siege, and defeated and slew his brothers Louis and Henry. But William, by cutting the dikes and flooding the country, allowed Admiral Brissot to bring his fleet to the relief of Leyden, which had long been beseiged. In 1576, the five provinces which had all along held to Spain joined the states-general at Ghent, and formed a league under William. But two years later, the new Spanish governor, Don John of Austria, won a victory near Gembloux. His successor, Alexander Farnese, also gained the Walloon provinces. However, William formed in 1579 a league between Holland, Zealand, Utrecht, Friesland, Gelderland, Gronigen, and Overyssel which was the foundation of the Dutch republic. Two years later, the United Provinces declared themselves independent, July 26, 1581. William twice refused to become the ruler of the new country, and was assassinated at Delft, July 10, 1584. See Motley's *The Rise of the Dutch Republic.*

Will'iams, John, a noted English missionary, was born at Tottenham, near London, June 29, 1796. He was trained as an ironmonger, but in 1816 went as a missionary to the South Sea islands. After learning the native language by a short stay at Eimeo, in the Society islands, he made his headquarters at Raiatea. His success as a missionary here and elsewhere was remarkable. The people rapidly became Christians, and adopted many civilized habits. Williams traveled unceasingly among the various island groups planting stations and settling native missionaries, whom he himself had trained. From the Society islands he visited the Hervey group, where he discovered the island of Raratonga. Most of the people of the group were converted in a remarkably short time, and Williams' influence over them was very great. At their request he drew up a code of laws for their government. At Raratonga, he built himself a ship with the help of the natives, and with this he made voyages to Samoa and other islands. In 1834, Williams came back to England, and had printed his translation of the New Testament into Raratongan. Four years afterward, he went back to the Pacific, and while visiting Erromango, one of the New Hebrides, was murdered by the natives Nov. 20, 1839. See *Memoir of John Williams*, by Rev. Ebenezer Prout.

Will'iams, Roger, born about 1600, was one of the founders of Rhode Island. In early life he left his home, either in Wales or in Cornwall, and went to London. Here his skill as a reporter gained him the patronage of Sir Edward Coke, who sent him to the famous Charterhouse school, and then to one of the universities. He next studied law, but, changing his mind, became a clergyman. On account of his Puritan beliefs he left England and reached Massachusetts bay in 1631. He preached for some years at Plymouth and at Salem. Chiefly on account of his strongly expressed opinion that the government should have no control of religious matters, he was exiled from Massachusetts colony. In January, 1636, he left with a few followers for Narragansett bay. At first the band settled on the site of Seekonk, Mass. But in June

Williams and five others embarked in a canoe for Rhode Island and founded a settlement, to which Williams, in remembrance "of God's providence to him in his distress," gave the name of Providence. He went to England in 1643 and the next year obtained a charter for the colony, of which he was made deputy president in 1649. In 1651, he made a second voyage to England in behalf of the settlers and spent there three years, during which he enjoyed the friendship of Milton, Cromwell, and other leading Puritans. From 1654 to 1658, Williams was governor of the colony, and died (in 1683) in his eighty-fourth year.

Will'iams, Samuel Wells, the historian of China, was born at Utica, N. Y., September 22, 1812. After studying at Rensselaer institute, at Troy, he went to Canton in 1833 as a printer in the employ of the American Board of Foreign Missions. In 1853, he acted as interpreter to Commodore Perry's expedition, which opened Japan to the world. As secretary of legation at Pekin, he was of great help in making the treaty of 1856 between China and the United States. In 1876, he became lecturer on Chinese at Yale college. He published several valuable Chinese dictionaries and text-books, but is best known by *The Middle Kingdom*, which is held to be an authority on Chinese history, life, and manners, both in America and in Europe. Professor Williams died at New Haven, Conn., Feb. 17, 1884. See his *Life*, by his son, F. W. Williams.

Will'iamsburg, formerly the capital of Virginia, is about fifty miles southeast of Richmond and as far from the entrance to Chesapeake bay. It is built on high ground on the tongue of land between the James and York rivers. Here is the eastern insane asylum of the state, opened in 1773, the oldest institution of the kind in America. The Episcopal church was built in 1678. The town, which was named after William III., was ordered built by the Virginian general assembly in 1699, and in 1700 the seat of government was moved here from Jamestown. The capital was changed to Richmond in 1780. Williamsburg is noted as the seat of the College of William and Mary, the oldest in the country, except Harvard. Its charter was obtained from England in 1693, and the reigning English sovereigns after whom it was named gave it money, lands, a tobacco duty, and the office of surveyor-general of the colony. This office it held until 1819, and among the state surveyors it appointed were Washington and Jefferson. At the outbreak of the Revolutionary war it was the richest college in America. Most or all of the buildings were burnt four times, in 1705, 1781, 1859, and 1862. French and American troops held the buildings in 1781, during the siege of Yorktown; and during the Civil war they were used as barracks, hospitals, or headquarters most of the time. Among the chancellors were George Washington and John Tyler. The college was reopened after the war, in 1869. Population of Williamsburg 2,044.

Will'iamsport, a city of Pennsylvania on the west branch of the Susquehanna, seventy miles northwest of Harrisburg. The post-office is a fine building, and there are many beautiful private grounds. Williamsport is the center of Pennsylvania's lumber trade, and the west branch is filled in spring with pine and hemlock logs. There are also a number of manufactures. The city was settled in 1797. Population 28,757.

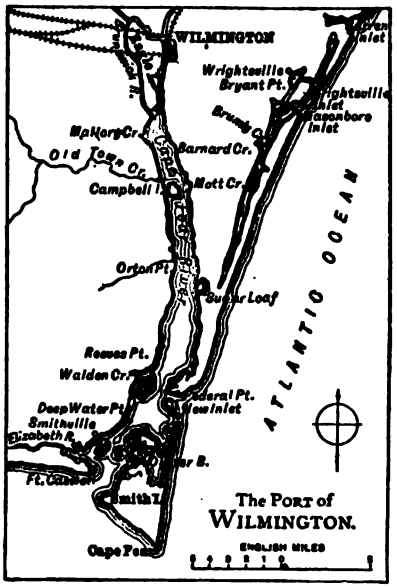
Will'iamstown, a town of Massachusetts, twenty-five miles east of Troy, N. Y. It nestles among the famous Berkshire hills, and is the seat of Williams college. The college was founded as a free school by the bequest of Col. Ephraim Williams, a Massachusetts soldier in the French and Indian war, who was shot in a skirmish near the head of Lake George, in 1755. At this spot the college alumni set up a monument to his memory in 1854. The first building was finished in 1790 and the school opened the next year. Two years later the school became a college. There are now 30 professors and about 600 students. Williams college is noted in many ways, but chiefly for its famous president, Mark Hopkins, and for the fact that American missions to the heathen started here in a students' prayer meeting. Population of Williamstown 5,013.

Will'is, Nathaniel Parker, was born at Portland, Me., Jan. 20, 1806. He graduated at Yale college in 1827, and the same year published *Poetical Sketches*. He wrote for the magazines, and in 1829 started the *American Monthly Magazine*. After its death, in 1831, he traveled in Europe, recording his saunterings in *Pencilings by the Way*, which with its lifelike and rapid sketches of Old World scenes at once gained him a wide popularity. These pencilings were contributed to the New York *Evening Mirror*, for which Poe also wrote. In 1839, appeared the most charming of his books, *Letters from Under a Bridge*. Others of the best of his writings are tales and sketches, such as *F. Smith, The Ghost Ball at Congress Hall*, and his simpler poems, like *Unseen Spirits*, *Spring*, etc. Willis died Jan. 20, 1867. See *Life*, by Henry A. Beers.

Will'ow, a class of trees of the same family as the poplar. Willows vary in size from those of the Alps, which are an inch or two high, to trees of from 50 to 80 feet. They are found in most countries, with the exception of Australia, and they grow rapidly. They have many and large roots, which grow a long distance through moist soil, and bind it with a network of fibers, thus preventing the banks of streams from being worn away. The bark is tough and bitter; it is used in making fish nets, ropes, etc.; for tan-bark, and sometimes

in Norway and Sweden for mixing with oatmeal. The wood is used in houses, vessels, farm tools, casks, etc.; as fuel and for charcoal. The twigs and young shoots are used in making baskets and light furniture. There are some sixty North American willows, ten of which are not found elsewhere. The most important of all kinds is the white willow, common throughout Asia, Europe, and America. It sometimes reaches the height of 80 feet. It is very useful on the prairies, as it is a fast grower, and also protects other trees from the wind. Other kinds are the golden, blue, brittle, varnished, and green willows. The weeping willow, a native of Asia and North Africa, has been introduced into America. It is a large tree, and one of the first to leaf out in the spring.

Wil'mington, the largest city and chief port of North Carolina, is on the Cape Fear river, twenty miles from the sea, and 110 miles southeast of Raleigh. It is a railroad center, and its wharves are kept busy with a



large coast and foreign trade. Steamers run to Baltimore, Philadelphia, and New York. The chief exports are lumber, turpentine, rosin, tar, pitch, shingles, and cotton. Wilmington was first called Newton, and was founded in 1733. During the Civil war, it was a noted port for blockade runners, until the capture of Fort Fisher at the mouth of the Cape Fear inlet by General Terry in January, 1865. In February of the same year, General Schofield forced the Confederates to abandon Wilmington. Population 20,976.

Wil'mington, the largest city of Delaware, is on the Delaware river, twenty-eight miles southwest of Philadelphia. The city stands on hilly ground between Brandywine and Christiana creeks, and slopes toward the Delaware, which is not yet reached by the built-up part of the city. At this point, sixty-five miles from the ocean, the Delaware is three miles wide, with thirty feet of water at mid-tide in its shallowest parts. There are electric lights and electric street cars. A fine park has been laid out along the Brandywine. The city annually expends the sum of $258,005 on its public schools, which have a force of 253 teachers, and an attendance of 11,005 pupils. The high school has a handsome building and furnishes manual training. The Old Swedes church, founded in 1698, received funds from William Penn, a bible from Queen Anne, and a communion service from the miners of Sweden. Among the larger manufactures are railroad passenger cars, for which it is the second city in America, powder, flour, morocco, carriages, and iron shipbuilding. Wilmington was founded in 1732, on the site of the first Swedish settlement in 1638. Population 76,508.

Wil'son, Alexander, an American naturalist, was born at Paisley, Scotland, July 6, 1766. He was a weaver and peddler, and at twenty-four published a volume of poetry. In 1794, he reached New Castle, Del., with but a few borrowed shillings in his pocket. While peddling through New Jersey he began to study the habits of birds, and after teaching some years, he determined to form a collection of American birds. His first trip was made in 1804 through the unbroken wilderness of western New York to Niagara Falls. He gave an account of this journey in his poem *The Foresters*. His position of assistant editor of *Rees' Cyclopædia* gave him more means and time for his undertaking, and when the first volume came out, in 1808, he spent some months in tramping, "looking for birds and subscribers." He sailed down the Ohio to Louisville, and rode on horseback from Nashville to New Orleans. He made another tour of the eastern states in 1812. He had, however, overworked himself in preparing his book, and lived only to finish seven volumes. Two more were edited by George Ord, who had accompanied him on some of his journeys, and the work was carried on further by Charles Lucien Bonaparte. Wilson was the first to make a careful study of American birds, and his great work on *American Ornithology* is a scientific classic. The author died at Philadelphia, Aug. 23, 1813. See *Difficulties Overcome*, by C. Lucy Brightwell.

Wil'son, Sir **Daniel,** a Scoto-Canadian educator, and archæologist, and from 1881 to 1892 president of Toronto university, was born at Edinburgh in 1816. In 1853, he was appointed professor of history and English literature in University college, Toronto, succeeded to the presidency in 1881. His writings embrace *Prehistoric Man; Prehistoric Annals of Scotland; Memorials of Edin-*

burgh; Caliban, the Missing Link; and a study of *Chatterton*. He was knighted in 1888, and died at Toronto, Aug. 7, 1892.

Wil'son, Henry, eighteenth Vice-president of the United States, was born at Farmington, N. H., Feb. 16, 1812. His proper name was Jeremiah J. Colbaith, which at twenty-one he had changed for some unknown reason to that of Henry Wilson. His father was a day laborer, and poor. When ten years old he went to work as a farm hand. The boy was greedy for reading, and before the end of his apprenticeship had read more than a thousand volumes. He then walked to Natick, Mass., and learned the trade of shoemaker, by which he paid his way through Concord academy. After setting up as a shoe manufacturer he became a noted public speaker in support of Harrison in the campaign of 1840. For the next ten years he was regularly elected to the state legislature. In 1848, he left the Whig party and became a Free Soiler. In 1853, he was defeated for governor on the Free Soil ticket, but two years later was made Sumner's colleague in the United States senate. Wilson had helped to form the anti-slavery society; throughout his political life he had earnestly upheld that cause, and he became one of the founders of the Republican party. In 1872, he was chosen Vice-president on the ticket with Grant, but died during his term of office, Nov. 22, 1875. He left three important historical works, *Anti-Slavery Measures in Congress, Reconstruction Measures in Congress,* and *The Rise and Fall of the Slave Power in America*. See *Life*, by Nason.

Wil'son, James Harrison, American soldier (major-general United States volunteers) was born near Shawneetown, Ill., Sept. 2, 1837, and was educated at McKendree college there and at West Point, where he graduated in 1860, and was assigned to the corps of topographical engineers, serving in the department of Oregon. He was distinguished as an officer of engineers in the Civil war, notably in the Richmond raid and in the operations near Petersburg; he commanded in 1864 the 3d division of Sherman's cavalry and the cavalry corps in the military division of the Mississippi; participated in the capture of Fort Pulaski, took part in the campaigns of Antietam, Vicksburg, Chattanooga, and the Wilderness; commanded in the assault and capture of Selma and Montgomery, Ala., Columbus and Macon, Ga., and finally in the capture of Jeff Davis. After the war, he was engaged in railroad and engineering operations; and in the war with Spain he commanded the 1st division of the 1st army corps in the campaign in Porto Rico. He is the author of *China: Travels and Investigations in the Middle Kingdom;* of a *Life of Andrew J. Alexander;* and in conjunction with the late Chas. A. Dana, of a *Life of General Grant.*

Wil'son, John, famous as the "Christopher North" of *Blackwood's Magazine*, was born May 18, 1785, at Paisley, Scotland, where his father was a rich manufacturer. After being privately tutored, he spent four years at Glasgow university, and then four more at Oxford, where he led in both scholarship and athletics. On leaving Oxford he settled in the beautiful lake country of Cumberland, where he soon became a close friend of Wordsworth, Southey, Coleridge, and De Quincey, and amused himself by measuring his strength against that of the far-famed Cumberland wrestlers, the very sturdiest of whom said that he was "a vera bad un to lick." After writing his first two poems, *Isle of Palms* and *The City of the Plague*, most of his fortune was lost through the rascality of a relative, and Wilson went to Edinburgh and became a lawyer. In 1817, *Blackwood's Magazine* was founded, for which, during its earlier years, Wilson and his friend Lockhart were the writers who gave it its success. In 1820, Wilson was made professor of moral philosophy in Edinburgh university. Here he had almost unexampled power of rousing the enthusiasm of his students. He, however, cared little for dignity, and on more than one occasion the professor of moral philosophy took off his coat in the public market place to punish some ruffian. The amount of his writings in *Blackwood's* was enormous; from this mass he selected and published in 1842 *The Recreations of Christopher North*. The power of his genius is best seen perhaps in the series of table talk, called *Noctes Ambrosianæ*. As a writer and a man the Scotch idolized him almost as much as they did Burns and Scott. He died at Edinburgh, April 3, 1854. See the *Memoir*, by his daughter, Mrs. Gordon.

Wil'son, William Lyne, LL.D., American statesman, and late president of Washington and Lee university, was born in Jefferson county, Va., May 3, 1843, and died at Lexington, Va., Oct. 17, 1900. After an education at the Columbian (D. C.) college and at the University of Virginia, he served for a time in the Confederate army, subsequently becoming a professor of Latin in Columbian college, and president of West Virginia university. He also studied and practiced law, and from 1883 to 1895 was a member of congress, regent of Smithsonian institution, and president of the National Democratic Convention of 1892. Between the years 1895 and 1897, he was postmaster-general of the United States, and in the latter year he accepted the presidency of Washington and Lee university. While in congress, he drafted the bill for the revision and reduction of tariff duties, known as the "Wilson Tariff Bill."

Wil'son, Woodrow, American historian and professor of jurisprudence and politics at Princeton university, was born at Staunton, Va., Dec. 28, 1856, and graduated at

Princeton. He subsequently studied and practiced law, and was for a time professor of history and political economy at Bryn Mawr college, but since 1890 has taught at Princeton. His writings embrace a life of *George Washington; Congressional Government, a Study in American Politics; The State, Elements of Historical and Practical Politics; Division and Reunion*, etc.

Win'chell, Alexander, a distinguished American geologist and author, was born in Dutchess county, N. Y., Dec. 31, 1824, and died at Ann Arbor, Mich., Feb. 19, 1891. In 1847, he graduated from Wesleyan university, Middletown, Conn., taught natural science subsequently in several schools, and was for a time president of the Masonic Female university, Selma, Ala. In 1854, he became professor of physics and civil engineering in the University of Michigan, and in the following year was transferred to the chair of geology, zoology, and botany there, which post he held until 1873. Between the years 1873 and 1878, he held the same position at the University of Kentucky, and a lectureship in geology at Vanderbilt university. In 1897, he was recalled to the University of Michigan as professor of geology and paleontology, which he retained for the remainder of his life. His published writings embrace *Sketches of Creation, The Doctrine of Evolution, The Geology of the Stars, Reconciliation of Science and Religion, Pre-Adamites, Sparks from a Geologist's Hammer, World-Life: a Comparative Geology, Geological Excursions*, and *Geological Studies*.

Wind'mill, a wheel driven by the wind for power purposes. Windmills have been used since the 12th century in Europe. The European mill, sometimes called the Dutch mill from its extensive use in Holland, for pumping purposes, consists usually of four inclined radial arms, revolving on an axis nearly horizontal. These arms are covered with canvas, and the diameter of the wheel is generally very large. One is mentioned with a diameter of 150 feet, but a common diameter is about a third of this. These wheels are largely used for pumping water and for grinding grain. They have various schemes for setting them to face the wind, a common method in Germany being to rotate the whole tower on wheels. The windmill has been developed in the United States along different lines, and the American windmills are so superior to the older forms that they now practically control the market. The American windmill consists of a wheel with a great number of narrow radial inclined arms of wood or metal, the axis of the wheel being horizontal, and the direction of the wheel being regulated by an arm carrying a vane. These wheels vary in diameter from ten to thirty feet; the largest sizes in ordinary winds develop as high as 4 H.P. The ordinary pumping wheel develops less than ¼ H.P. The number of hours that they run depends on local conditions. Wolff, who has written the best book on windmills, estimates an average of eight running hours per day for most parts of the United States. The number of windmills in use is very great, and the manufacture of them is a very large industry. One firm in the United States is said to make nearly 20,000 windmills annually. For small powers where constant and continuous service is not vital, as in pumping water, grinding feed, etc., windmills are, according to Wolff, the cheapest power available.

Win'dom, William, an American politician and financier, was born in Ohio in 1827. After being admitted to the bar he went to Minnesota and entered politics as a congressman in 1858. He was regularly re-elected for ten years, and was in his second term as United States senator when, in 1881, he was appointed secretary of the treasury in President Garfield's cabinet. On Garfield's death in that year, he resigned and was at once sent back to the senate, having in the short time that he held his secretaryship gained the reputation of being a worthy successor of Hamilton, Gallatin, and Sherman. In 1889, he was again made secretary of the treasury in President Harrison's cabinet, but died before serving out his term, at New York, Jan. 29, 1891.

Win'dow, an opening in the wall of a building to admit light and ventilation. Windows were practically unknown among the Greeks and Romans; at least, the few windows used were mere holes in the side of the building. Even among the Anglo-Saxons a window carried with it no association of glass as it does to us, for the early windows in England were merely covered with stretched hide or filled with lattice work. The Anglo-Saxon word for window is *eagdura*, that is an "eye door"; and our word for window is a compound of *wind* and *eye*. Even as late as the discovery of America, 1492, windows were enormously expensive. See Trail's *Social England*, Vol. II., p. 572. It is only since the days of cheap glass that the luxury of windows, as we now understand them, has been enjoyed by every one.

Winds are currents in the earth's atmosphere, produced by disturbances which result from differences of temperature in different parts of the country. Thus the air in contact with heated ground becomes itself heated and rises to the upper regions, thus diminishing the barometric pressure in that locality. Accordingly, the air flows in from neighboring regions where the barometric pressure has not been diminished, and this current is what is known as a wind. Winds have received various names, according to their velocities and their characteristics. Thus a barely perceptible wind moves from one to two feet per second; a moderate breeze, from 10 to 20 feet per second; a fresh breeze from 20 to 30 feet per

second; a strong breeze, from 30 to 55 feet per second; a storm, from 55 to 90 feet per second; a hurricane, from 90 to 120 feet per second.

Regular winds are those which blow always in the same general direction. Such are the trade winds.

Periodical winds are those which recur at regular intervals. Among these may be mentioned the land and sea breezes of the seashore; the *sirocco* of Algiers, a wind which blows off the desert of Sahara, etc. Most of our winds are *variable*. See CYCLONE, and STORM.

Wind'sor Castle, the chief home of the English sovereigns, is at Windsor, a town on the Thames river, twenty-one miles from London. As early as the time of the Heptarchy, there was a stronghold there. Henry III. built a round tower on the site, but it was wholly rebuilt by Edward III. in 1344, as a meeting-place for his newly established order of the Knights of the Garter. He chose this spot because of the popular story that King Arthur used to sit here surrounded by his Knights of the Round Table. Henry III. built many of the present walls and towers, and two chapels, one of which Henry VIII. gave to Cardinal Wolsey, who had a costly tomb erected there, and the chapel was for a long time after known as "Wolsey's tomb-house." It is now called the Albert memorial chapel. The magnificent chapel of St. George ranks next to Westminster abbey as a royal burying-place. Among the many treasures kept in the royal library is a fine collection of drawings by the chief Italian painters, and a series of eighty-seven portraits by Holbein, of Henry VIII.'s court. The royal forest of Windsor is one of the finest in England.

Wine, the fermented juice of grapes. For wine making, grapes are usually picked dead ripe, and sometimes are even allowed to wither, while some wines are made from raisins, and champagne and other kinds from grapes not quite ripe. In making the best wines, great care is taken with the grapes, the unripe or faulty berries being picked off the bunches by hand and only the best bunches used. The grapes are put into the winepress, a large tub, and the juice pressed out by treading with the naked feet, or mechanical presses are used for this purpose. The juice runs through holes in the bottom of the press into a vat where it is left to ferment, this process lasting from a few hours to several days. This fermentation or "working" changes the sugar of the juice or "must" into alcohol and throws off carbonic acid gas. When the must has stopped frothing and becomes clear and cool, it is drawn off from the vat, or "racked" and put into casks, where a second fermentation takes place. In sweet wines or liquors, all the sugar is not changed into alcohol; when all or most of the sugar is so changed, the wine is called dry wine. When wines are bottled before fermentation is finished they contain carbonic acid gas, which causes them to foam when uncorked. This gives the sparkle to champagne and other wines. The color of wine comes from the skins, white grapes yielding an amber-hued wine, and dark grapes the rich color of clarets and port. Logwood, burnt sugar, etc., are also used to color wine. In the middle ages, most of the wine drunk in Europe came from the Greek islands which grew the famous malmsey. Later, the Rhine wines of Germany and the Burgundy wines of France became noted, and then began the vine culture and wine trade which has spread all over those countries. Their chief wines now are Bordeaux or claret, champagne, Burgundy, Hockheim, and Moselle. The finest of the Hungarian wines is Tokay. Spain furnishes the sherry wines and Portugal, port. One of the best of the many Italian wines is the Lachrymæ Christi. Madeira has long been famous for its fine white wine. The California wines are the best in the United States, and amount to over a third of the yearly output of the country, about 30,000,000 gallons.

Winkelried (*vink'el-rēt*), **Arnold von,** a hero of Switzerland, the story of whose exploit is, after that of William Tell, the most popular in the early history of the Swiss confederation. We are told how, at a critical moment in the great battle of Sempach, when the Swiss had failed to break the serried ranks of the Austrian knights, a man of Unterwalden, Arnold von Winkelried, came to the rescue. Intrusting his wife and children to the care of his comrades, he rushed toward the Austrians, gathered as many of their spears as he could together against his breast, and fell pierced through and through; but into the gap thus made rushed the Swiss mountaineers and routed the Austrians. By the battle of Sempach (July 9, 1386), Switzerland gained its freedom.

Winneba'go, Lake, the largest lake in Wisconsin, is 28 miles long from north to south, about 10 miles wide, and covers about 212 square miles. It is navigable, as is also Fox river, which carries its waters to Green Bay and Lake Michigan. For fifteen miles along the eastern shore is a rock wall, in some places reaching hundreds of feet below the surface. Fond du Lac and Oshkosh border it.

Winneba'goes, a tribe of Indians belonging to the Dakota family, whose name means "men from the salt water." The French traders found them a large tribe in the Green Bay region of Wisconsin, and ruling over the neighboring Algonquin tribes. But in the beginning of the 17th century, several banded tribes cooped them up in one town, where 500 warriors died of want and sickness. The Illinois next attacked them, and at the end of the war the Winnebagoes were only a small tribe. They fought with the French against

the English, and with the British against the Americans. They were conquered by Gen. Anthony Wayne, and were among the tribes banded together by Tecumseh. They ceded their land in parcels, beginning in 1829. By 1846, they had all been removed from Wisconsin, except a few who had taken allotments of land. After being sent to several reservations in Iowa, Minnesota, and Dakota, they were moved to Winnebago, Nebraska, and given in charge of the Quakers, who, as well as the Catholics and Presbyterians, established missions among them. They number now about 2,000.

Win'nipeg, the capital of Manitoba, stands at the junction of the Red and Assiniboine rivers, 764 feet above the sea, and 400 miles northwest of St. Paul. A number of fur traders' forts stood on its site. It was laid out as a town in 1870, when Rupert's Land became a part of Canada, and the province of Manitoba was formed. The city is built on both sides of the Assiniboine, but only on the west side of the Red river, the suburb of St. Boniface being on the east side. The city is well built, and has water, gas, electric light, and seven railroads; it is the center of the Canadian Northwest. There are here Manitoba university, Manitoba college, Manitoba Medical college, St. Boniface college, and St. John's college. The city hall, parliament buildings, and courthouse are handsome buildings. Population 42,336.

Win'nipeg, Lake, a large lake in Manitoba, Saskatchewan, and Keewatin, about 260 miles long, from 6 to 60 miles wide; and covering about 8,500 square miles. It stands 628 feet above the sea. It drains about 400,000 square miles. It receives the waters of Lakes Manitoba and Winnipegosis, of the Lake of the Woods, of the Red, Berens, and Saskatchewan rivers, and discharges its own waters through the Nelson river into Hudson bay. In winter, the ice is sometimes five feet thick, and in the upper part does not disappear till June.

Winnipego'sis, Lake, meaning "Little Winnipeg," a lake of Manitoba and Saskatchewan. It is about 125 miles long; its greatest width is 25 miles, and it covers about 2,000 square miles. It is 60 feet higher than Lake Winnipeg and 20 feet higher than Lake Manitoba, into which it discharges its waters by means of Water Hen river. The waters of Dauphin lake, and Swan and Red Deer rivers, fall into Lake Winnipegosis.

Winnipiseogee (*win'e-pe-sä'ke*), **Lake,** a lake of New Hampshire, 25 miles long and about 10 miles wide. There are a number of bays and many islands. The Winnipiseogee, or Winnepesaukee, river carries its waters to the Merrimac. Its waters are very clear and deep, and well stocked with fish.

Wino'na, the fourth city of Minnesota, on the Mississippi, ninety-six miles southeast of St. Paul. It is built on rich lowlands under the Mississippi bluffs. One of its finest buildings is the State Normal school. Winona is a large wheat and lumber mart, besides which it has manufactures of carriages, farm tools, sashes and doors, flour, etc. The city was settled in 1851. Population 19,714.

Wins'low, Edward, governor of Plymouth colony, was born at Droitwich, Worcestershire, England, Oct. 19, 1595. He came to New England in the *Mayflower* and offered himself to the Indian chief Massasoit as a hostage for the fair dealing of the colonists. In this way, and by curing the chief when he was sick, he gained his friendship. After two voyages to England on behalf of the colony, he was made governor in 1633, in 1636, and in 1644. On his third visit to England, in 1635, he was imprisoned for seventeen weeks by Archbishop Laud for teaching in the church, as he was not a clergyman. Winslow's portrait in the gallery of the Pilgrim society at Plymouth is said to be the only authentic likeness of any of the *Mayflower* pilgrims. His marriage with Mrs. Susanna White was the first marriage in Plymouth colony. In 1655, Cromwell sent Winslow on a mission to the West Indies, but he died on the voyage, May 8, 1655. See Justin Winsor's *Narrative and Critical History of the United States.*

Win'slow, John Ancrum, American admiral, who in 1864, when in command of the *Kearsarge*, defeated and sunk the Confederate privateer *Alabama* off Cherbourg harbor, was born at Wilmington, N. C., Nov. 19, 1811, and died at Boston, Mass., Sept. 29, 1873. Entering the United States navy in 1827, he served in the Mexican war and for gallantry was given command of the *Morris*, and subsequently promoted to the rank of commander. After his encounter with Captain Semmes and the sinking of the *Alabama* (June 14, 1864), he was promoted to commodore, and in 1866–67 commanded the Gulf squadron. In 1870, he received a rear-admiralship, and was given command of the Pacific squadron (1870–72), dying in the following year, aged sixty-two.

Win'sor, Justin, American historian and librarian, was born at Boston, Mass., Jan. 2, 1831, and died at Cambridge, Mass., Oct. 22, 1897. After studying at Harvard and at Heidelberg, he became superintendent of the Boston library and held this post from 1868 to 1877, passing in the latter year to the librarianship of Harvard. From 1876 to 1886, he was president of the American Librarian association, and was also president of the American Historical association, and secretary of the Massachusetts Historical society. He was a large contributor to the periodical press and an extensive and instructive author. His chief publications embrace *The Readers' Handbook of the American Revolution, Bibliography of Original Quartos and*

Folios of Shakespeare, Christopher Columbus, Cartier to Frontenac, a *Narrative and Critical History of America*, and was editor of the *Memorial History of Boston*.

JUSTIN WINSOR.

Wins'ton, N. C., a city and manufacturing center, the capital of Forsyth county, adjoining the city of Salem, in the northwestern portion of North Carolina. It is on the Southern and on the Norfolk and Western railroads, twenty-seven miles west of Greensboro, and 120 miles northwest of Raleigh. It has a number of tobacco factories and warehouses, besides iron works, cotton and woolen mills, carriage and wagon factories, and shuttle and bobbin works. Population 10,008.

Win'throp, John, governor of Massachusetts colony, was born at Groton, Suffolk, England, Jan. 12, 1587. He became a lawyer, and because of his good and religious character he was chosen governor by the Massachusetts Bay company in 1629. The next year he came over, bringing with him 900 emigrants. He was generally re-elected every year throughout his life, except from 1634 to 1636, when he was deputy under Sir Harry Vane. His influence was very great in the colony, and through it on the life, thought, and later politics and institutions of New England. Governor Winthrop's *Journal* is one of the most important sources of early American history. His son John was governor of Connecticut. Governor Winthrop died at Boston, March 26, 1649.

Win'throp, Theodore, an American author, was born at New Haven, Conn., Sept. 22, 1828. He was graduated at Yale college in 1848. He then entered business in New York, spent two years at Panama and opened a law office at St. Louis. On the outbreak of the Civil war he enlisted, and was one of the earliest martyrs of the struggle, being shot while leading a charge at Big Bethel, June 10, 1861. He was hardly known as a writer till the appearance in the *Atlantic Monthly* of his life-like sketches of *Washington as a Camp*, describing the march of his regiment, the famous New York Seventh, and its first quarters in the capitol at Washington. Soon after his death his novels were published from manuscript, and his magazine stories reprinted. *Cecil Dreeme*, *John Brent*, and his other novels have a breezy, outdoor air about them that is delightful, while the short story, *Love and Skates*, is an English classic.

Wirt, William, was born at Bladensburg, Md., Nov. 8, 1772. He began to practice law in 1792 at Culpepper Court House, Va., but within a few years moved to Charlottesville and thence to Richmond. In 1803, appeared his *Letters of a British Spy*. He took part in the prosecution of Aaron Burr, and was attorney-general of the United States from 1817 to 1829. In 1832, he ran for the presidency on the ticket of the anti-Masonic party. Wirt is now best remembered as the author of the famous *Life of Patrick Henry*. He died at Washington, D. C., Feb. 18, 1834. See *Life*, by J. P. Kennedy.

Wiscon'sin covers 54,450 square miles; its greatest length from north to south is 300 miles; its breadth 250 miles. No peaks are over 1,800 feet high. The state is merely a swell of land between the basins of Lakes Michigan and Superior and the Mississippi. The highest part of this swell is within thirty miles of Lake Superior. In the south central part of the state is the diagonal valley occupied by Green bay, and the Fox and Wisconsin rivers. The ice of the glacial period invaded in force the eastern and northern part of the state, while an area of 10,000 square miles in the southwestern part was left untouched. About 2,000 lakes and many waterfalls dot the northern and eastern part, all within the portion covered by the glacial ice. The greater part of the state was once covered by forests, though there were occasional prairies in the south and west. Oaks, poplars, and hickories are the chief trees, while maple, elm, and ash forests are found along the eastern border. In the north, a once unbroken forest of pine and hard wood covered the state. This is the great lumber region of Wisconsin. Almost half the state is now covered with woods, and Wisconsin produces more lumber than any other state, except Michigan and Pennsylvania.

The leading crops in order are oats, corn, wheat, potatoes, barley, hay, and tobacco. Large water-power for mills is found chiefly on the Fox, Wisconsin, and Chippewa rivers. The leading products are lumber, flour, wooden articles, iron products, beer, and articles made of leather. The largest iron mines are found in the Menominee region and along the Montreal river. Lead and zinc are found in the southwest. Building stone is plentiful; the best is the red-brown sandstone of Bayfield county and the granite of Marquette county. Whitefish and lake trout are caught in large quantities in Lakes Superior and Michigan, while pickerel, bass, pike, sturgeon, and brook trout are plentiful in the 3,000 square miles of inland clear-water lakes. There are 6,566 miles of railroad. The Fox and Wisconsin rivers are joined by a canal at Portage, and the Sturgeon Bay canal joins Green bay and Lake Michigan.

The state legislature, made up of the senate and assembly, meets every two years. The

public school fund at interest is $3,000,000, besides valuable lands. The elementary schools have 11,818 teachers and 418,366 pupils; the high schools have a force of 647 teachers and an attendance of 17,548 pupils; and there are 10 colleges and universities with 233 professors and instructors and 3,361 students. The chief colleges are the University of Wisconsin at Madison, Beloit, Ripon, Milton, and Racine colleges, and Lawrence university. The State university and Beloit college, especially, stand high throughout the country.

In Wisconsin are many of the animal mounds of the "Mound Builders," and the finest collection of old copper tools and weapons has been made in this state. Wisconsin was the meeting ground of the great Algonquin and Dakota families of Indian tribes. As its waters connected the Great Lakes and the Mississippi, it was the keystone of the French possessions in Canada and Louisiana. The fur trade first drew French explorers to Wisconsin. Going up the Ottawa they would cross to Lake Huron, whence they easily passed through the straits of Mackinaw to Green bay; thence up the Fox to the Portage between it and the Wisconsin, and on to the Mississippi. The first known white man to enter Wisconsin was Jean Nicollet, who went up the Fox in 1634. In 1665, Father Claude Allouez founded a Jesuit mission at La Pointe, followed four years later by the mission of St. Francis Xavier on the shores of Green bay. By the ordinance of 1787, Wisconsin was made part of the Northwest Territory. In 1825, a war with the Sacs and Foxes and Winnebagoes won from them the lead mining region. Black Hawk's war took place in 1832. Wisconsin territory was formed in 1836, and it became a state in 1848. Wisconsin furnished to the Union army during the Civil war over 91,000 men, the famous Iron Brigade being chiefly from that state. Population, in 1900, 2,069,042.

Wiscon'sin River, a branch of the Mississippi, rises in lake Vieux desert on the northeastern border of Wisconsin, and flows south 600 miles falls into the Mississippi four miles below Prairie du Chien. It is navigable for steamboats for 200 miles to Portage, where it is joined by canal to the Fox, thus making a waterway across the state from Lake Michigan to the Mississippi, by way of Green bay, the Fox, and the Wisconsin.

Wiscon'sin, Univer'sity of, located at Madison, is a part of the free school system of the state and is coeducational. It was established by the constitution when the state was organized in 1848. In 1866, the university was reorganized and united with the college of agriculture, endowed with the proceeds of the agricultural college grant given by the United States in 1862. It is supported by income from three sources, a state tax, federal grants, and private gifts. The buildings of the university are thirteen in number, and the grounds comprise 300 acres, extending for more than a mile along the shore of Lake Mendota. The departments of instruction embrace a department of graduate study, college of letters and science, school of economics, political science, and history, school of education, college of mechanics and engineering, college of agriculture, college of law, school of pharmacy, and school of music. The faculty numbers 151, and the number of students in attendance, exclusive of the summer school, is 2,200.

Wise, Henry Alexander, an American statesman, was born at Drummondtown, Va., Dec. 3, 1806. He graduated at Washington college, Pennsylvania, and studied law. He became prominent in politics, advocating the nomination of Jackson at Baltimore, and favoring the doctrine of state rights. He was sent to congress in 1833, where he went over to the Whig party, in opposition to Jackson's course. Under Tyler, whose nomination Wise had secured, he had a strong influence, and was made minister to Brazil, and in 1854 governor of Virginia. In December, 1859, he signed the death warrant of John Brown. Though making an effort for peace as a member of the Virginia convention, he went with his state into secession, and became a brigadier-general in the Confederate army. He served in the Kanawha valley, and at Roanoke island, where his forces were captured and his son was killed. He wrote *Seven Decades of the Union.* He died at Richmond, Va., Sept. 12, 1876.

Wise'man, Nicholas, cardinal and Catholic archbishop of Westminster, was born at Seville, Spain, of Irish parents, Aug. 2, 1802. He studied in Ireland and at Rome, where his brilliant course secured him in 1823 the appointment of vice-rector of the English college, which in 1828 was changed to rector. In England, he was first known by a series of lectures on the doctrines of the Catholic church, which was followed by the founding with Mr. O'Connell of the *Dublin Review.* His appointment as archbishop of Westminster and cardinal produced great excitement, as it was looked upon as an effort of the Catholic church to recover possession of England, where there had been no Catholic bishops since the reign of Elizabeth. Wiseman's addresses and publications did much to allay the excitement, and his ability and moderation, as well as his literary position, won him the admiration of all. He wrote on literature and art besides his religious works. *Influence of Words on Thought and Civilization, Lectures on Religion and Science, Points of Contact between Science and Art,* and *The Real Presence,* were books that obtained a large circulation. He died at London, Feb. 15, 1865.

Wista'ria, a class of climbing plants named after Professor Wistar, of Philadelphia. The leaf is formed of from nine to fifteen oval leaflets, and the flowers, usually lilac in color, grow in thick, long clusters, and resemble the flowers of the locust tree, or sweet peas or other plants of the "leguminosæ" or bean family, to which it belongs. The seeds or beans are found in long pods. It grows rapidly, often 20 feet in a season. The Chinese wistaria, introduced from Japan, blooms earlier, with a looser cluster of flowers, of a paler lilac or white. There are several other varieties, including a double-flowered one.

Witch and Witch'craft. The names "witch" and "wizard" are given to persons supposed to possess unusual powers, popularly thought to have been acquired by a compact with Satan. The belief is an old one, as the Witch of Endor appeared to Samuel in the early days of the Jewish nation, and Paul had several contests with sorcerers. Sorcerers, sooth-sayers, diviners, and magicians were often popularly classed together and with witches; but the magicians claimed to be a distinct class, using their knowledge of the secrets of nature for the benefit of mankind, while the witches and sorcerers delighted in doing harm. The belief in evil spirits has been common in every nation and country, and the legends of a people are full of the deeds of supernatural beings. In popular belief, a witch was usually an old woman, who rode on a broomstick through the air by night to attend the witches' gathering, and who delighted in acts of spite and meanness. Their victims, on whom they had cast the evil eye, pined away mysteriously, or were troubled by strange noises and curious losses, etc. The witches' mark was a spot of some kind made on the body by the devil as a sign of his bargain, and was indelible, and was sought for by the class of inquisitors known as the witch-finders. Shakespeare's *Macbeth* and other plays, Burns' *Tam O'Shanter*, and the *Walpurgis Night* in Goethe's *Faust*, give an idea of these popular beliefs.

The belief in witchcraft as the work of evil spirits led to the bloody and cruel prosecution and punishment of witches which lasted in Europe for four centuries, and in which it is estimated 9,000,000 persons were put to death. The bull of Pope Innocent VIII. in 1484 began the work of destruction, in which by torture confession was extorted, and the testimony of enemies and children accepted. In one year in the district of Como, 1,000 persons suffered as witches and 500 in three months in Geneva, while 4,000 persons perished in Scotland, and during the session of the long parliament alone 3,000 persons were condemned in England. The delusion was almost universal, such a judge as Sir Matthew Hale giving sentence against a suspected person, and a physician as eminent as Sir Thomas Browne declaring his belief in witchcraft, inspite of having written a volume on *Popular Fallacies*. The last execution in England was in 1716, and the laws against witchcraft were repealed in 1735. The last execution on the continent took place in Posen as late as 1793. The notorious persecution of supposed witches in Salem, Mass., was a result of the general belief so common at the time. Cotton Mather published, in 1685, an account of cases of witchcraft and made experiments on suspected persons, by which he learned that the devils understood Latin, Greek, and Hebrew well, but the Indian dialects only imperfectly. He wrote *Wonders of the Invisible World* to convince doubters, and his book received the recommendation of the governor of the state and the president of Harvard college. Nineteen persons were hanged between June and September of 1692. See *Salem Witchcraft*, by Upham.

Witch-ha'zel, the name of a small tree or shrub belonging to a family of which there are several species, among them the liquid-amber, a forest tree. The witch-hazel grows in damp woods about ten feet high, has leaves much like the hazel, with clusters of three or four bright yellow flowers which appear in the fall. The fruit is a pointed two-celled pod, which does not ripen until the next summer. The wood is white, the bark and leaves contain tannin, and an extract of the bark and leaves is used as an external application in medicine. The name comes from the popular belief that a branch of the tree carried in the hand will turn toward the ground to indicate a hidden supply of water.

Wittenberg (*wit'ten-bĕrg*), a town of Prussian Saxony, is on the Elbe river, fifty-five miles southwest of Berlin. It is famous as the home of Luther and Melanchthon, whose tombs are in the church on the doors of which Luther nailed his famous "theses." The church was restored, and in 1858 new bronze doors with the theses in Latin were erected. In another church are two pictures, one of Luther preaching, and the other of Melanchthon administering the communion. The houses of Melanchthon and Luther are still shown, Luther's containing his chair and table and two portraits of himself, and in the market place is a bronze statue of him. The university where Luther was professor, and where, according to Shakespeare, Hamlet studied, has been removed to Halle. Wittenberg has manufactures of woolen and linen goods, hosiery, leather, brandy, and beer. Until 1422, it was the residence of the dukes and electors of Saxony. In 1547, it was taken by Charles V., and in 1760 by the Austrians, when nearly one-third of it was destroyed. Napoleon captured it in 1806 and fortified it in 1813, the Prussians finally capturing it in 1814. Population 22,000.

Wo'burn, Mass., a city and manufacturing center in Middlesex county, eastern Massachusetts, on the Boston and Maine railroad, ten miles northwest of Boston. The chief industry of the place is the tanning and dressing of leather, the manufacture of boots and shoes; there are also some glue factories and chemical works. The town has a number of good schools, churches, and a well-equipped public library. Population 14,254.

Wolcott (*wōl'kŏt*), **Roger,** a governor of Connecticut, was born at Windsor, Conn., Jan. 4, 1679. He was in service in the attack on Canada in 1711, and at the siege of Louisburg in 1745. He was governor of Connecticut from 1751 to 1755, and had already been a member of the assembly, and of the council, a judge, and the deputy governor. He published a volume of poems, and a historical work in which is a description of the Pequot war. He died May 17, 1767.

Wolf, a carnivorous mammal belonging to the dog family. The domesticated dogs are very likely descended from wolves. The latter animals have a wide geographical range, being found over nearly the whole of Europe, Asia, and North America. There are none in South America or Africa, the jackal and foxes apparently taking their place in those countries. Wherever found near inhabited regions, they prey upon sheep, which they run down in open chase. Assembled in packs, they also attack herds of cattle, and when bisons were abundant on the western plains, they would overcome those large animals. Several centuries ago wolves were abundant in the British islands, but they were hunted by the ancient Britons, and at different times a reward was offered for their heads and skins. As a result they were exterminated. They became very scarce in the 16th century, and by the middle of the 18th century were exterminated in Europe, Scotland, and Ireland. In America, the common wolf and its varieties extend from Greenland to Mexico. They are about sixty-five inches long, with a tail of fifteen inches. They vary in color, but are chiefly gray, becoming whitish in the north and dark in the south. In Florida, there are black wolves and in Texas red ones. The coyote is a smaller wolf peculiar to the United States. It is common on the western plains, burrowing in the ground. It reaches a length of about fifty-five inches, and is yellowish gray clouded with black. See JACKAL, DOG.

COMMON WOLF.

Wolfe, Charles, a British poet, was born at Dublin, Dec. 14, 1791. He graduated at Trinity college, Dublin, and was a curate in Tyrone county. He is famous for his ode on the burial of Sir John Moore, beginning "Not a drum was heard, not a funeral note," which is known to every schoolboy. He died at Cork, Feb. 21, 1823.

Wolfe, James, an English general, was born at Westerham, in Kent, England, Jan. 2, 1727. When only thirteen years old, he was prevented by sickness from going with his father, a British officer, on the expedition to Carthagena. In his first service in Flanders, he took part in the famous battle of Dettingen, and in Scotland was at the battles of Falkirk and Culloden. His conduct while in charge of a regiment in Scotland, and in the expedition against Rochefort in 1757, won him the rank of colonel, and gave him the command of a brigade in the expedition against Cape Breton. His skill and bravery at the attack on Louisburg won him the title of "Hero of Louisburg." In the effort to drive the French out of Canada, Pitt gave the charge of the invading army to Wolfe, who had been made major-general. The story of his attack on Quebec, how he scaled the cliffs with his army by night, and died in the moment of victory, while his brave antagonist Montcalm, dying too, said: "It is a great consolation to have been vanquished by so brave an enemy," is well known. He died Sept. 13, 1759, when only thirty-three years old. See *Life*, by Wright; *Montcalm and Wolfe*, by Parkman.

Wolseley (*wōlz'lĭ*), Viscount **Garnet Joseph,** G. C. M. G., P. C., etc., field-marshal, and lately commander-in-chief of the British army, was born near Dublin, June 4, 1833, and was educated under tutors. He entered the English army in 1852 and served successively in the Burmese war and in the Crimean war, and was severely wounded at the siege of Sebastopol. He subsequently served in India and China, and in 1867 in Canada, where he acted as deputy-quartermaster general and commanded the expedition to the Red river. In 1873, he commanded the troops on the Gold coast during the Ashanti war, and entering Kumasi received the submission of the king. For this campaign he received the thanks of the British parliament and a gratuity of £25,000 "for courage, energy, and perseverance." He also received the freedom of the city of London and a sword valued at 100 guineas. In 1875, he was governor of Natal; in 1880, quartermaster-general of the forces; and from 1882 to 1885 was adjutant-general. In 1882, he

LORD WOLSELEY.

was in command of the expeditionary force in Egypt, and of the Gordon Relief expedition. Subsequently he was commander of the forces in Ireland, was raised to the rank of general (1882) and field-marshal (1894), and from 1885 to 1900, was commander-in-chief of the army, being relieved at the latter date by Lord Roberts. He is the author of a *Life of Marlborough*, of the *Decline and Fall of Napoleon*, and of *The Soldier's Pocket-Book for Field Service*.

Wolsey (*wŏl-zĭ*), **Thomas,** an English cardinal, was born at Ipswich, in Suffolk, England, in 1471. He secured by some means an education at Oxford, and became rector at Lymington. Through the influence of a friend he was made chaplain to Henry VII., with whom he became a favorite, and was appointed dean of Lincoln. When Henry VIII. became king, Wolsey governed the kingdom. Honors were showered upon him. In the church he was made bishop of Lincoln, archbishop of York, and cardinal. In 1515, he was prime minister and lord high chancellor. He was successful in command of the royal army at Tournay, and effected a treaty in 1514 with Louis XII. of France, which left England the first power in Europe. His income was enormous, and large sums were used in founding a college at Ipswich and Christ Church college at Oxford. Wolsey's efforts to obtain the pope's permission for Henry's divorce of Queen Catherine were unsuccessful and lost him the royal favor, which alone had stood between him and those whom his splendid living and overbearing conduct had made his enemies. Anne Boleyn, whose marriage to the king he had opposed, with her uncle Norfolk now plotted his ruin. He was driven from court to his diocese in York, where he won the hearts of the people by his gracious manner. The king, too, showed signs of relenting, and his enemies alarmed, had him arrested for high treason, but he died at Leicester abbey on his way to London, Nov. 29, 1530. See Shakespeare's play, *Henry VIII.*; *History of England*, by Froude.

Wol'verine, a carnivorous animal of the northern forests of Europe, Asia, and America. There is only a single species. The American form reaches a length of about 30 inches, and is covered with shaggy hair of a blackish color, with pale bands along the sides of the body, and one on the forehead. The body and limbs are stout and the animal resembles a small bear. It climbs trees, and, during the breeding season, forms burrows for the mother animals. It feeds on squirrels, hares, foxes, grouse, reindeer, and other animals. It is noted for its cunning and often steals bait from traps. Michigan is called the wolverine state, from the occurrence of the wolverine in its forests.

Wolverhampton (*wŏl-ver-hamp'tun*), a market town of Staffordshire, England, is thirteen miles northwest of Birmingham, on a height which commands a fine view toward Wales. The old church was founded in 996 and the free grammar school in 1515. There is a corn exchange, market hall, agricultural hall, public baths, a free library, a cattle market covering five acres, and a large park. It is famous for the manufacture of hardware, especially iron implements, tools, locks, hinges, nails, and kitchen furniture. It has also smelting furnaces, iron and brass foundries, chemical works, dye works, rope walks, varnish works, and breweries. The town was named Wulfrunahamton in honor of Wulfruna, sister of Ethelred II., who founded the church and college in 996. Population 89,662.

Wo'man's Chris'tian Tem'perance Un'ion. See TOTAL ABSTINENCE.

Wom'bat, a marsupial, or pouched animal of Australia. The body of the common wombat is a little more than two feet long, covered with dark brown hair, and the animal has somewhat the appearance of a small bear. The tail is rudimentary and the legs are short and stout. The toes end in sharp, curved claws which are of service to the animal in burrowing. These animals are active at night, they feed largely on roots. They are easily caught alive, but in captivity show no affection for their keepers, caring only for the food given them. Their flesh is said to resemble pork in flavor and is often eaten in Australia.

Wood Carv'ing, one of the oldest branches of art, was much practiced among the Egyptians, Greeks, and Romans. A life-size statue of a man carved out of a solid block of sycamore, dating probably from 4000 B. C., now in the Boulak museum, is a fine specimen of Egyptian wood carving. Egyptian carvings have been preserved in the tombs, but the Greek and Roman carvings have nearly all perished and are known to us only by the descriptions of early writers. It was much used in the decoration of churches in the middle ages, and reached its height in the 15th century, when every church had its carved oak screen and stalls. The roof of Westminster hall, made in the early part of the 15th century, is one of the finest examples of the open timber roof in use, which admitted of very fine decoration. Skill in wood carving still lingers in Nuremberg and Switzerland. The Moslem wood carvers of Persia, Syria, and Spain produced beautiful work, as seen in the mosques and private houses of Damascus, Cairo, and other oriental cities. The wood carving of China and Japan is the finest in the world.

Wood Engrav'ing is a process of copying pictures from blocks of wood, and differs from plate or steel engraving in having the picture raised on the surface of the wood, instead of being sunk, as it is in the metal. The picture is printed from the prepared

block, just as the letters are from type, the block being made the height of the type. The wood must be hard and fine grained, boxwood being the best. The block of wood is covered with a white coating, on which the artist draws the picture with a lead pencil, pen, or brush. The engraver then cuts away all of the wood around the drawn lines, leaving them raised or in relief. For large pictures several blocks are fastened together for the drawing, and then given to different engravers, so that a large picture can be produced very quickly.

Wood engraving is the earliest and simplest form of engraving. The Chinese claim to have printed from wooden blocks 1,000 years before Christ, and it is probable that the art was brought from China to Europe. A wood cut of St. Christopher, dated 1423, is one of the oldest specimens of engraving. It was used largely in Europe in the 15th century for two very opposite purposes, the engraving of playing cards and the illustration of books of devotion. A book of forty leaves, with a picture and a text of Scripture on each page, is one of the earliest illustrated books known, dating back to the early part of the 15th century. Durer made great advances in the art in the beginning of the 16th century, and Bewick, who published in 1790 his *British Quadrupeds*, and in 1804 *British Birds*, illustrated by himself, showed the possibilities of the art and made it what it is to-day — one of the most important of the arts. Its use has become general in books, magazines, and newspapers.

Wood, Leon'ard, major-general United States volunteers, and military governor of Cuba, was born at Winchester, N. H., Oct. 9, 1860, and graduated in medicine at the Harvard Medical school (1884). In 1886, he was appointed first lieutenant and assistant surgeon United States army, and reached the rank of captain and surgeon in 1891. In 1886, he served in Arizona and New Mexico in General Miles' campaign against the Apaches under Geronimo and Natchez, and received a medal of honor for this duty. In May, 1898, on the outbreak of the Spanish-American war, he recruited the 1st regiment of United States volunteer cavalry ("Rough Riders"), and took part in the fight at Las Guasimas and in the battle at San Juan, near Santiago de Cuba, and was given the rank of brigadier-general for gallant service in Cuba. In July, 1898, he succeeded General Brooke as governor-general of Cuba, where he has greatly aided in the orderly government and in the improved sanitary condition of the island.

Woodbine, a common name for the Virginia creeper or American ivy, *Ampelopsis quinquefolia*. The name was originally applied in Europe to a species of honeysuckle (*Lonicera*).

Wood'chuck, or Ground Hog, a burrowing rodent of eastern North America belonging to the family of ground squirrels. It is a true marmot. It is about eighteen inches long and grizzly gray in color, varying to chestnut and blackish. It is destructive to crops and a pest to the farmer. Ground hog day is Feb. 2; according to an old tradition the animal then awakes from its winter sleep and comes from its burrow. If the sun is shining, it returns for another six weeks, but if it cannot see its shadow, it knows that there will be an early spring. See MARMOT.

Wood'cock, a famous game bird belonging to the snipe family, and found in northern parts of both the Old and New Worlds. The American woodcock is about eleven inches long, variegated in black, brown, gray, and rusty colors. The bill is very long and flexible at the end. It is thrust into the soft ground, in search of earthworms, and the

WOODCOCK.

presence of woodcocks can often be detected by a cluster of these holes. The European bird is larger. It is a winter resident in England, breeding in summer in north Scotland.

Wood'pecker, the name for any member of the family *Picidæ*. This includes birds with stout bills with which they peck wood to obtain insects. Their long tongue is barbed at the end and capable of being greatly protruded. It is in every way adapted for piercing and securing insect larvæ. These birds are of great service to the farmer. There are about 350 species found in all parts of the world, except the Australian region and Madagascar. Nearly one-half of the entire number occur in the New World, and about twenty-five species are found in North America. Their colors are generally bright and the males usually have some red on the head. Among the species of the United States the flicker, or golden-winged woodpecker, is one of the best known. It feeds mainly on ants and therefore is frequently seen on the ground. The other woodpeckers are almost always seen on trees. The red-headed woodpecker is abundant in the United States east of the

Rocky mountains. The downy and hairy woodpeckers are smaller birds, both being common. The ivory-billed woodpecker, with a length of twenty-one inches, is the most magnificent of North American woodpeckers. It is black, with white on the shoulders and wings, and, in the males, a scarlet crest. This bird is found in the south and formerly ranged as far north as southern Illinois. See Eckstrom's *The Woodpeckers* (1901).

Wood's Holl, a town in Falmouth township, Barnstable county, Mass., on Cape Cod, noteworthy as being a center for zoological research. Here is located the Marine Biological laboratory (C. O. Whitman, director), which is the most important seaside laboratory in America. The laboratories of the United States Fish commission are also located here.

Wool, one of the most important of all animal substances, ranks next to cotton in its use in the manufacture of clothing. It is a sort of hair, growing on sheep, and goats. The fiber of the wool differs from a hair in being crinkly or wavy, and having very minute scales, both of which properties fit it for its uses. The wavy twist keeps it from unwinding when made into yarn, and the scales make the threads catch each other, a process known as felting. Wool varies in quality with different species of sheep, and also with the food and shelter and climate. The Saxon wool has the most of the felting property, and the wool of the Angora goat, called mohair, is the whitest, while that of the Cashmere goat is very soft and rich though short. The merino sheep furnishes one of the best varieties of wool, a single fleece usually weighing about four or five pounds. In the manufacture of woolen goods, the wool is sorted into different grades, washed, scoured, and dried. It is then dyed, if to be dyed in the wool, and carded or made into threads, ready for weaving. After weaving, the cloth is scoured to remove the oil and dust, dyed, if dyed in the piece, and dried on stretchers. It is then fulled, a process that shrinks the cloth and makes it more compact. Teasling, a process to raise the threads, and shearing, which cuts them the right length to form the nap, follow, shearing being often repeated several times. The boiling of the cloth, which prevents spotting and gives a luster, brushing, pressing, and folding, finish the work. Broadcloths, cassimeres, and beavers are strictly woolen goods, while merinoes, bombazines, delaines, etc., are worsted goods, from the town of Worsted, England, in which the processes of manufacture are somewhat different, the wool being combed, which prevents its felting as closely, and also differently spun. The introduction of machinery and steam-power has revolutionized the manufacture of woolen goods. A woman could card one pound of wool a day by hand, and spin two skeins of yarn a day, and weave two or three yards of cloth a day. Now, by the use of machinery, one worker can card 150 pounds of wool, spin 500 pounds, and weave from 35 to 50 yards of cloth in a day. The amount of wool produced in the world is estimated at about 2,000,000,000 pounds a year, over one-half of which comes from Australia, South America, and South Africa. Great Britain has been the largest producer of woolen goods, but the manufacture is growing rapidly in the United States both in extent and in the quality of the goods.

Woolsey (*wŏl'zĭ*), **Theodore Dwight,** an American scholar, was born at New York city, Oct. 31, 1801. He studied at Yale, at Princeton, and for three years in Germany. He became professor of Greek at Yale college in 1830, and from 1846 to 1871 was the president of that institution. He was considered an authority on questions of international law, on which he published a volume. He also edited in Greek a number of Greek plays, and wrote several religious works. The American company of revisers of the New Testament selected him as their president. He died at New Haven, Conn., July 1, 1889.

T. D. WOOLSEY.

Woolwich (*wŏl'ĭch*), a town in Kent, England, on the Thames river, about nine miles east of London. It is known as the seat of the principal arsenal of Great Britain, and has the government factories for producing war material of all sorts, except gunpowder. The dockyards have existed since 1515, and some of the largest ships of the English navy have been built here. The royal artillery barracks and the Royal Military academy are also situated at Woolwich. Population 44,848.

Woonsock'et, a city in Rhode Island, on the Blackstone river, sixteen miles northwest of Providence. Woonsocket hill, 580 feet high, the highest point in Rhode Island, is near the town. It has good schools and a free library, but is principally a manufacturing town, especially of woolen and cotton goods. Washing machines, rubber goods, and musical instruments are also made. Population 28,204.

Woos'ter, a city in Ohio, eighty miles northeast of Columbus. It is a well-built town, standing on high ground, in a rich farming region. It has factories of agricultural implements, strawboard, whips, organs, and furniture. Wooster university, founded in 1866, has three departments, including the

medical school situated at Cleveland, with 29 instructors and about 575 students. Population 6,063.

Woos'ter, David, an American general, was born at Stratford, Conn., March 2, 1710. He was in the naval service, in command of a vessel to protect the coast in the war between England and Spain, and had command of a war vessel on the expedition to Louisburg. He was in active service during the French and Indian war, and in the Revolutionary war had command in Canada, after the death of Montgomery. When the British invaded Connecticut, in 1777, Wooster attacked them at Danbury and was mortally wounded April 27, and died May 2, 1777. A monument to him was built by the state.

Worcester (*wŏs'ter*), a city of England, is on the Severn river, about twenty-six miles from Birmingham. It is an old town, the old smelting works in the neighborhood being thought to date back to the time of the Romans. The cathedral, one of the noted ones of England, dates from 1084. It was much injured in the Civil war, but has been lately restored at great cost. Of the industries, the most important is glove-making and the manufacture of porcelain, the Royal Worcester ware being celebrated for its fine designs and beautiful execution. Other manufactures are those of leather, horse-hair weaving, vinegar, wine, and engines. Population 45,908.

Worces'ter, a city of Massachusetts, forty miles southwest of Boston. It ranks next to Boston in population and is a beautiful city, with wide, shaded streets; public parks, and fine buildings. The city annually expends the sum of $557,449 on its public schools, which have a force of 539 teachers and an enrollment of 18,831 pupils. Among the higher educational institutions are Clark university, founded in 1888, for strictly graduate work, Worcester academy, the Free Institute of Industrial Science, the College of the Holy Cross, and Polytechnic institute. The public library; the American Antiquarian society, with a fine library; the state insane asylum, one of the finest buildings in the country; and the soldiers' monument by Rogers, are other noticeable features. The city is extensively engaged in manufactures, such as boots and shoes, machinery and machinists' tools, stoneware, jewelry, carpets, machine needles, awls, wirework, cotton thread, blankets, felt, water meters, horse collars, and nails. Worcester was settled in 1713. Population 118,421.

Worces'ter, Dean Conant, assistant professor of zoology in the University of Michigan, and member of the Philippines Commission of 1899, by appointment of the late President McKinley, was born at Thetford, Vt., Oct. 1, 1866, and graduated from the University of Michigan. In 1887, and again in 1890, he was a member of the Steere and of the Menage scientific expeditions to the Philippines, in both of which he studied the fauna and other interesting scientific features of the islands, as well as the existing conditions of the people. In 1900, he was appointed a member of the United States Philippines Commission, and has written a work on the country, entitled *The Philippines and Their People*. In 1893, he was named instructor, and in 1895 assistant professor of zoology and curator of the zoological museum at the University of Michigan.

Worces'ter, Joseph Emerson, an American lexicographer, was born at Bedford, N. H., Aug. 24, 1784, and died at Cambridge, Mass., Oct. 27, 1865. In 1811, he graduated at Yale, and in his early career wrote several geographical and historical text-books, together with one or two popular dictionaries. His chief work in lexicography, however, was the quarto *Dictionary of the English Language*, which appeared first in 1860, and which met with much success.

Words'worth, William, an English poet, was born in Cumberland, England, April 7, 1770. He studied at Cambridge, and traveled in France, where he sympathized strongly with the revolution, but fortunately was compelled by poverty to return home before his friends, the Girondists, were sent to the guillotine. His first publications, in 1793, were two poems, *An Evening Walk*, and *Descriptive Sketches*, which made little impression upon the public, but won the recognition of Coleridge and the friendship of Calvert, who left him at his death $4,500, that he might carry out his desire to devote himself to poetry. He settled with his lifelong companion, his sister Dorothy, at Alfoxden in Somersetshire, to be near Coleridge. *Lyrical Ballads* was the joint production of the two poets, but brought Wordsworth no nearer to public recognition. Sure of himself, he continued his work, publishing several volumes, which were the laughingstock of the critics; the works of Southey and Coleridge, forming with Wordsworth the "Lake School," as it was called, coming in for their share of ridicule. Wordsworth's home was now at Rydal Mount, in the lake district of England. A claim of the family against Lord Lonsdale was paid, and a county office with a small salary was secured for the poet, so that he was able to marry and give himself wholly to his literary work. Gradually a select circle of admirers, Leigh Hunt, De Quincey, Wilson, and others, made the poet appreciated, and when his *Excursion* appeared, in 1814, his genius was acknowledged. From that time it grew until he ranked as the first poet of his day. He received a pension of $1,500 in 1842, and in 1843 became poet laureate. His *Excursion* and *The White Doe of Rylstone* are the only long poems. His shorter pieces, such as *Intimations of Immortality, The*

Skylark, and *The Daisy*, with his sonnets, are the most popular. Some of his early poems, *The Idiot Boy* and *Alice Fell*, etc., still provoke a smile and justify in some degree the ridicule of the critics. Wordsworth died April 23, 1850. See *Memoirs*, by Wordsworth; *Studies in Wordsworth*, by Hudson.

World's Fairs. See EXPOSITIONS.

Worms, a town in Hesse-Darmstadt, on the Rhine. It is one of the oldest cities in Germany and is the scene of the *Nibelungenlied*. Held by the Romans, destroyed by Attila, rebuilt by Clovis, the residence often of Charlemagne and his successors, it was made a free imperial city by the emperor, Henry V. Many German diets (national assemblies) were held here, the most famous being the one when Luther defended his work as a reformer before Charles V. During the middle ages it was a large city with extensive trade, but was almost destroyed by the French in 1689. Among its ancient buildings still standing is the cathedral founded in the 8th century. Tobacco, leather, and wine are the principal manufactures. Population 26,000.

Worms. See VERMES.

Wren, the name for several sprightly little birds always in motion. About a half-dozen species are found in the eastern United States. The house wren nests about yards in any suitable hole or cavity and shows a liking for a bird box, if it can find one unoccupied. It is a pert, bobbing bird about five inches long, of a brown color above, marked with black and gray, and grayish and rusty below. The winter wren is smaller, being only four inches long, but of similar appearance to the house wren. In summer it nests north of New England, but is a common winter resident in the eastern states. It is a fine singer. The long-billed marsh wren is abundant in reedy swamps, making a big globular nest with a little hole on one side, all suspended from rushes. The Carolina wren is a remarkable singer. It is a larger bird, reaching a length of six inches, its color is reddish brown above and pale buff below. It ranges through the southern states north to Pennsylvania. The European bird is a small lively bird, nesting in gardens and hedges, and is a great favorite.

Wren, Sir **Chris'topher,** an English architect, was born in Wiltshire, England, Oct. 20, 1631. He studied at Oxford, where he invented some mathematical instruments. He also, while residing at Oxford as a fellow, became a member of a society for studying and experimenting in natural philosophy, and Evelyn in his *Diary* speaks of Wren at this time as "that miracle of a youth." He made improvements on the newly invented barometer, and a globe of the moon, which he finished by order of the king at the request of his scientific friends, who also asked the king to command Wren to continue "drawing the shapes of little animals as they appear in the microscope." He was professor of anatomy at Oxford and at London, and with others formed the Royal society. He had already made plans for the restoration of St. Paul's cathedral in London, when it was destroyed by the fire of 1666, but in 1675 the new building was begun under his direction, and in 1710 the last stone was laid by his son. Other buildings planned by Wren are the royal exchange, temple bar, customhouse, and fifty churches in London; the Gateway tower, Christ church, Oxford; Pembroke college, Cambridge; the Royal observatory at Greenwich; Buckingham house; and the towers of the west front of Westminster Abbey. He died Feb. 25, 1723, and was buried at St. Paul's. His tomb has the inscription, "*Si monumentum requiris, circumspice* (If you seek a monument, look around). Steele has introduced him in the *Tatler*, in the character of Nestor.

Wright, Carroll Davidson, American statistician and United States commissioner of labor, was born at Dunbarton, N. H., July 25, 1840, and had an academic education. In the Civil war, he enlisted in the United States army, and rose to be colonel of the 14th New Hampshire volunteers. In 1872, he became a member of the Massachusetts senate and chief of the Massachusetts Bureau of the Statistics of Labor. Since 1885 he has been United States commissioner of labor, and took part in the labors of the 11th United States census, and since 1895 has been lecturer on social economics in the Catholic university of Massachusetts. He has written largely on Statistics and on Labor, among his published works being *The Factory System of the United States*, *The Relation of Political Economy to the Labor Question*, *Convict Labor*, *Strikes and Lockouts*, *Working Women in Large Cities*, *Railroad Labor*, *Industrial Evolution of the United States*, *Outline of Practical Sociology*, *Marriage and Divorce*, and *Annual Reports* (1873–88) *of the Massachusetts Bureau of Statistics.*

Writ'ing, the expression of thoughts by characters so as to make them known to others, is found in many forms. The hieroglyphic or picture writing, in which the idea is expressed by a picture, which afterward became a sign, was common in Egypt, Assyria, and Mexico. The invention of the alphabet, which is the basis of the modern art of writing, is ascribed to the Phœnicians, who are thought to have taken some of the signs used in the hieroglyphic writing of Egypt and made of them the characters which represent the sounds of the voice as we now find them in alphabets. The Latin letters were introduced into England by the Romans, and what is called the Roman-Saxon writing prevailed until the

Saxon became general in the time of Alfred. The Norman writing came in with William the Conqueror, and the Gothic, Old English, and English court hand followed. The direction of the writing varies in different nations; the Mexican picture writing begins at the bottom, the Chinese and Japanese write in columns, beginning at the top and going from right to left, and Hebrew is written from right to left. The materials used were various, including papyrus, parchment, and paper, and the instruments have also varied from the stylus and quill to the modern pen. See CUNEIFORM.

Wur'temberg, a kingdom of the German empire, is in the southern part of Germany, separated from Switzerland by Lake Constance. Its greatest length is 139 miles and its width 105 miles, with an area of 7,528 square miles. The Black Forest is on the western border; the Swabian Alps cross the country for eighty miles, dividing it into the valley of the Danube and the valley of the Neckar, which are the principal rivers. The climate is mild in the Neckar valley, but cold in the mountains. It is an agricultural country, with extensive orchards, gardens, and vineyards, and the grains, hay, and fruits are the main products. There is but little coal, but extensive peat beds, fire clay, iron, salt, gypsum, and tourmaline are found. There are manufactures of linen, woolen, cotton, and silk goods. Beer breweries and brandy distilleries are numerous, and 215,500,000 bottles of beer have been used in a year in the country, or 125 bottles for each person. The government is a hereditary monarchy. In the German empire, Würtemberg has four votes in the federal council and seventeen representatives in the diet, or congress, of the empire. Education is compulsory, and there must be at least one school in every commune. Recent official reports show that there is no person in the kingdom over ten years old who cannot read and write. There are 2,334 elementary schools, with 4,855 teachers and 294,521 pupils, and there are 17,969 students in the higher schools; while the educational system is completed by the University of Tübingen, founded in 1477. The Suevi held the country when the Romans found it, followed by the Alemanni and the Franks. Ulric I., count of Würtemberg, added to the territory from 1246–65. In 1495, the counts became dukes. The country suffered in the Thirty Years' war and was invaded by a French army which took Montbéliard. Würtemberg was made a kingdom at the peace of Presburg, 1805, the first king, Frederick, being succeeded by his son William I., who reigned fifty years, giving his people a liberal constitution in 1819, and many other reforms. Würtemberg joined the German empire in 1871. The capital is Stuttgart (population 176,318). Population 2,165,765.

Wurzburg (*vurts'burg*), a city of Bavaria, is in a beautiful valley on the river Maine. Among the noticeable buildings are the episcopal palace, one of the most magnificent royal houses in the world, the large Julius hospital, the cathedral, rebuilt in the 11th century, and the beautiful Marien Kappelle, with fourteen statues of the 15th century. The university, founded in 1582, has medical and law schools, and musical departments, the medical school being connected with the hospital and having a high reputation. There are also gymnasium, agricultural, and trade schools, and a Catholic seminary. The manufactures are woolen goods, mirrors, leather, tobacco, and wines. Population 68,747.

Wy'andots, a tribe of American Indians of the Iroquois family, found originally around Lake Huron. They were called Tobacco Indians by the French, because of the large quantity of tobacco raised by them. They were nearly exterminated by the Iroquois, the survivors finally settling in Michigan, mainly around Detroit, where they furnished the English with 400 warriors in the War of 1812. They settled later on the Sandusky river in Ohio, but sold their lands to the United States and moved to Kansas.

Wy'andotte Cave, a curious cave found in Indiana, four miles from Leavenworth. It is 22 miles long, and the two largest rooms are 245 feet high. In Mammoth hall is a mountain, 175 feet high, with three statues, one called Lot's Wife. The dome is 70 feet from the top of the mountain. The White Cloud Room, Beauty's Bower, and the Pillared Palace are other points of interest, all beautifully decorated with crystals, thought by many to exceed in beauty those of Mammoth cave.

Wy'att, Richard John, an English sculptor, was born at London, May 3, 1795. He studied at London and Paris, and at Rome in the studio of Canova. His favorite subjects were classical. *Penelope, Ino and Bacchus,* and *Eucharis and Cupid* are some of his best-known works, whose delicacy and finish placed him in the front rank of English sculptors, and gained him the highest medal for sculpture at the great exhibition in 1851, though he had died at Rome, where he resided, May 29, 1850.

Wy'att, Sir **Thomas,** an English poet, was born in Kent, England, in 1503. He studied at Cambridge, held a court position under Henry VIII. and at Anne Boleyn's wedding. He was English ambassador at the court of Charles V., and on his return lived at Allington in retirement. His poems were published with those of Surrey in 1557. He shares with Surrey the honor of introducing the sonnet into England, and his love poems are among the sweetest of the time. He died Oct. 11, 1542.

Wycliffe (*wik'lif*), **John,** an English reformer, was born near Richmond, in Yorkshire, England, about 1324. He studied at

Oxford, was master of Baliol hall, since Baliol college, and finally rector of Lutterworth, in Leicestershire. His first opposition to the Romish church was shown in contending for the king against the papal claim to certain tribute money. In 1374, on a visit to Bruges, where he was sent to confer with the papal legate, he seems to have been confirmed by what he saw in his opposition to the pope. His opinions soon brought him into trouble, as he was summoned in 1378 before a religious body, but a London mob burst into the chapel and stopped the proceedings. The pope issued "bulls" (papal decrees) against him, and he was again summoned to Lambeth, but escaped with an injunction to be careful what he preached. He began translating the Bible, sending copies of parts of it from village to village. He had a large following, the Lollards, as his disciples were called, being found in all ranks of the people. He was again summoned before the church tribunal, his works condemned to be burned, and he himself banished from Oxford to his parish at Lutterworth. He died Dec. 31, 1384. His bones were taken up by order of Clement VIII. in 1428, and burned, and the ashes scattered into the Swift, a branch of the Avon. Besides his Bible, which was the first English version, he wrote a large number of tracts, over 200 being burned in Bohemia. See *Life*, by Vaughn.

Wyoming (*wi-o'ming*), one of the western states of the Union, lies between Montana and Colorado. It is 350 miles long and 275 miles broad, covering 97,575 square miles, and as large as New England with Indiana. The Rocky mountains cross the state from southeast to northwest, the snowy peaks rising above the evergreen forests, with rocky cañons for the rivers, and broad, bare plains. Fremont's peak, 13,570 feet high, and Laramie peak, about 11,000 feet high, are among the highest summits. The Laramie mountains, Wind River mountains, Big Horn mountains, Black hills, Rattlesnake hills, and Medicine Bow mountains, are some of the different ranges. The average elevation of Wyoming is about 6,000 feet, and 3,300 square miles are more than 10,000 feet above the sea. The Laramie plains, covering 2,000,000 acres, are 7,000 feet above the sea. The Yellowstone, Madison, and Gallatin rivers flow into the Missouri, and the Snake river to the Pacific. The forests cover about 10,000,000 acres, furnishing yellow and white pine, white spruce, and red cedar. Only one-sixth of the state can be cultivated, and irrigation has had to be introduced, about 5,000 miles of canals having been built at a cost of $10,000,000. The mineral resources of the state are largely undeveloped. Gold and silver have been discovered in almost every county, and the coal region covers 30,000 square miles, some of it producing a very fine coking coal. Iron mountain is a mass of red ore, seven miles long; and on the Laramie plains are several soda lakes, with deposits from 10 to 40 feet thick, and salt springs, soda springs, and sulphur springs. The climate is cool in summer, and cold and dry in winter. Grazing and mining are the leading industries. The Yellowstone National park, covering 3,575 square miles, occupies nearly all of the northeastern part of the state, and has more remarkable natural curiosities than any other equal area in the world. (See YELLOWSTONE PARK.) The elementary schools have 523 teachers and 12,773 pupils; the high schools have 13 teachers and 269 pupils; while higher education is afforded by the University of Wyoming, founded in 1887, with a large land grant from the general government, a force of 14 teachers, and an attendance of 59 students. Cheyenne is the capital. The territory of Wyoming was formed from Idaho, Dakota, and Utah in 1868. Fort Laramie, built in 1834, was bought by the United States in 1849. Fort Bridger, built by a famous trapper, James Bridger, became Mormon property in 1853. The overland route to California passed through Wyoming, and the first emigrant trains crossed it in 1834. The first settlers were Mormons, in the Green river valley, in 1853. The Indians contested the settling of the state in continual warfare, until General Crook reduced them to submission in 1876–77. The Sioux have been removed to Dakota, the Utes to Colorado, the Crows to Montana, and the Shoshones and Arapahoes to a reservation on Wind river in the state. Wyoming was admitted to the Union in 1890, and was the first state to give the ballot to women. Population 92,531.

Wyo'ming Valley is a beautiful valley on the Susquehanna river, in Pennsylvania, inclosed by mountains. During the Revolutionary war, a company of 400 British troops, with 700 Indian allies, entered the valley, where was a town of 2,000 inhabitants. Many of the defenders of the place were absent in the Continental army, and only 300 men could be gathered to meet the attack. After a desperate struggle, July 3, 1778, they were driven back to the fort, which surrendered on July 5, when the Indians massacred indiscriminately all who could not escape by flight. Campbell has preserved the story in his poem *Gertrude of Wyoming*. It is now thought that the Mohawk chief, Brant, according to Campbell one of the chief actors, was not present at the attack. In 1843, a monument was erected on the battlefield. See *Wyoming*, by Peck.

X

Xanthippe (*zan-tip'pe*), the wife of Socrates, has the reputation of being an arch termagant, doubtless with some reason. Still it should be remembered that her naturally infirm temper must have been severely tried by the small concern manifested by Socrates in relation to his domestic affairs. Socrates had completely mastered his naturally strong appetites and passions and had acquired a temper of perfect serenity. It is but natural then that historians, on ever so small a basis of fact, should delight to match such a philosopher with a woman of such a temper as Xanthippe is said to have possessed. On the other hand, if we can trust Plato, she seems to have really loved her husband, and at his death he tenderly committed her to the care of his friends. Many stories are told of her to illustrate her peculiar infirmity, but it is impossible to tell how much credit should be given to them. The era of Socrates was 470–399 B. C.

Xavier (*zav'i-er*), **Saint Francis,** "the apostle of the Indies," one of the first members of the Society of Jesus, was born at Navarre, Spain, April 7, 1506. He was educated at Paris, graduating in 1530. Soon afterward he joined the society formed by Ignatius Loyola, and on Aug. 15, 1534, took vows with five others, devoting themselves to missionary work in Palestine. Being prevented from carrying out this plan by war, they formed the order of Jesuits, and when Loyola was requested to send missionaries to the Portuguese settlements in the Indies, Xavier was selected, and with one associate set out from Lisbon in 1541. He went first to Goa, to the island of Ceylon, then to Malacca, and across to Japan. He intended next to go to China, but died when only in sight of that empire, Dec. 5, 1552. He was buried at Goa. It is said that during his ten years' apostleship, he planted the faith in 52 different kingdoms, preached the gospel through 9,000 miles of territory, and baptized more than 1,000,000 persons. He was canonized by Pope Gregory XV. in 1622.

Xenia (*zē'ni-a*), county seat of Greene county, O., is a flourishing city, midway between Cincinnati and Columbus, on the Pittsburg, Cincinnati, Chicago, and St. Louis railway. Besides its various manufactories and other enterprises it is the seat of the Theological seminary of the United Presbyterian church and the Ohio Soldiers' and Sailors' Orphans' home. Wilberforce university, an institution for the education of colored youth of both sexes, is located three miles from the city. Population 8,545.

Xe'non. See ARGON.

Xenophon (*zĕn'o-fon*), a Grecian general, historian, and philosopher, was born at Athens 430 B.C. At an early age he became a pupil of Socrates, and is said to have been saved from death by that philosopher at the battle of Delium. At the age of forty he joined the expedition of the younger Cyrus against Artaxerxes Mnemon, king of Persia, and after the battle of Cunaxa and the treacherous murder of the Greek generals, played an important part in the Retreat of the Ten Thousand. Soon after his return to Greece he settled in a small town in Elis, where he lived for over twenty years, occupying himself in agriculture and literary pursuits. He is supposed to have died at Corinth, 355 B. C. Xenophon's principal works are the *Anabasis*, which is a history of the expedition of Cyrus and the Retreat of the Ten Thousand; the *Cyropedia*, or education of Cyrus, and the *Memorabilia*, a series of dialogues intended to refute the charges on which Socrates was condemned to death.

Xerophytes (*zē'ro-fits*), plants adapted to dry soil and air. The drought conditions may be occasional, periodic, or permanent, and plants have various ways of meeting them. The plan is to avoid as much exposure as possible and to store what water can be obtained. Prominent among drought adaptations are underground habits ("geophilous plants"), rolling or folding of leaves, profile position of leaves ("compass plants"), motile leaves which can shift their position ("sensitive plants"), small leaves, etc. Probably the most conspicuous feature of plants in permanently dry regions is the organization of reservoirs which retain water and dole it out, according to the need. Such plants, therefore, are usually fleshy or succulent. The xerophytic societies are numerous, and among them may be mentioned "rock societies," composed of plants living upon exposed rocks, walls, etc.; "sand societies," including beaches, dunes, and sandy fields; "shrubby heaths," in which species of the heath family abound; "plains," the great dry areas in the interior of continents; "cactus deserts" of the southwestern states and Mexico; and "tropical deserts," where the drought conditions are extreme and the vegetation scanty.

Xerxes (*zerk'sēs*) **I.**, king of Persia, was the eldest son of Darius by his second wife Atossa, and was appointed successor by his father in preference to Artabozanes, his eldest son by his first wife. Darius died 485 B. C. in the midst of his preparations for a third expedition against Greece; and as soon as Xerxes had subdued the rebellious Egyptians, he gave his whole attention to the completion of his father's plans for the subjugation of the

Grecian states. A bridge of boats a mile in length was built across the Hellespont; and a canal was cut through Mt. Athos, near which the fleet of Mardonius had been wrecked in 492 B. C. In the spring of the year 480 B. C., the vast army, said to number 2,000,000, began to march toward the Hellespont; according to Herodotus it took this force seven days and nights to march across the bridge. Grote, who discredits the immense numbers given by Herodotus, nevertheless says: "We may well believe that the numbers of Xerxes were greater than were ever assembled in ancient times, or perhaps at any known epoch of history." This immense force moved on without resistance till it was brought to a stand by Leonidas at Thermopylæ; and although the Greeks were all defeated and slain, it was not without severe fighting and heavy loss on the part of the Persians. When Xerxes arrived at Athens, three months after crossing the Hellespont, he found the city deserted. Meantime, the two fleets had taken their positions in the narrow strait between Salamis and the Attic coast, where the great naval battle of Salamis took place, in which the Persians were signally defeated, Xerxes himself fleeing in haste to the Hellespont. The bridge of boats having been destroyed in a storm, he crossed over in a vessel, leaving Mardonius with 300,000 men to carry on operations in Greece. The next year that general was defeated by the Greeks in the famous battle of Platæa; and in 478 B. C. the Persians lost their last possession in Europe by the capture of Sestos in the Hellespont. Little more is known of the history of Xerxes, except that he was murdered by Artabanus, who aspired to the throne, and was succeeded by his son Artaxerxes 465 B. C.

Ximenes (*zĭ-mē'nēs*), **Francisco, De Cisneros,** by which latter name he is commonly called in Spain, a well-known statesman, archbishop, and cardinal, was born at Torrelaguna, in Castile, in the year 1436. His great reputation for piety and learning led Queen Isabella to choose him in 1492 for her confessor, and three years after to appoint him archbishop of Toledo—a dignity which he refused to accept until he had received an express command from the pope. In the year 1507, he was still further promoted to the dignity of cardinal. During the lifetime of Isabella he was the guiding spirit in Spanish affairs; and on her death, in 1504, he held the balance between the parties of Ferdinand and Philip of Burgundy, husband of Joanna, heiress of the crown. When Ferdinand died, in 1516, he named Ximenes regent of Spain until the arrival of his grandson Charles; and although the grandees formed a powerful combination against him, he was able to subdue them by his prompt and efficient measures and compelled them to submit to his authority. He died at Roa, on the Douro, Nov. 8, 1517.

Ximenes de Quesada (*zĭ-mē'nēz da ka-sä'dä*), **Gonzalo,** a Spanish explorer, was born in Granada, in 1498, and came to America in 1535, when, under the orders of the governor Santa Marta, he took command of an expedition against the Chibcha Indians in New Granada. After enduring great privations and overcoming all obstacles in his way, he conquered the cities of Tuna and Iraca, where he secured a vast quantity of treasure, which he divided among his soldiers. In the year 1538, Ximenes founded the city of Bogota, and soon after sailed for Europe with Frederman from Venezuela and Benalcazar from Quito, in order to refer all matters in dispute between them to the king. Ximenes was at first fined and suspended from his offices by the king, but was afterward sent to New Granada with the title of marshal, and in 1561 was appointed governor-in-chief of New Granada, which position he continued to hold until his death, which took place at Mariqueta, Feb. 16, 1597.

X-Ray. See ROENTGEN RAYS.

Xylem (*zī'lĕm*), (in plants), that portion of a vascular bundle which contains the tracheary tissue and commonly called the wood. The xylem is chiefly concerned in the "ascent of sap," and in trees forms all of the trunk except the bark. See VASCULAR BUNDLE.

Y

Yacht (*yŏt*), a small vessel constructed so as to secure elegance and speed, and exclusively employed for racing and pleasure sailing. The first authentic record of a sailing club is in 1720, when the Cork Harbor Water club, now known as the Royal Cork Yacht club, was established in Ireland, but the boats were small. From this time to the end of the 18th century yachting developed very slowly, so that it may be said that yacht racing as a pastime scarcely had a beginning at the opening of the 19th century. During that century, however, the progress was such that there are numerous yacht clubs both in Europe and the United States, and improvements almost without number have been devised for increasing the speed and efficiency of vessels constructed for yachting purposes. As to the number of yachts now afloat, cruisers as well as racers, the British yacht fleet, which in 1850 consisted of 500 sailing vessels and three steamers, now numbers over 3,000 yachts. Next to Great Britain, the United States possesses the largest number afloat, amounting to about 1,200, and if to the foregoing are added the yachts of other countries, a grand total of 5,000 or 6,000 is reached. While the construction of sailing vessels has wonderfully progressed since 1850, the building of steam yachts has gone on still more rapidly. The building of yachts has changed greatly from the simple, unpretending brig, with small tonnage, clumsy build, and baggy sails of the early yachts of the Royal Cork club, to the immense flat sails, larger size, long, narrow shape of the yacht of the present time. The effect of these changes was a great increase of speed. Racing yachts are schooners, cutters, or yawls. The schooners are nearly always fore-and-aft rigged, *i. e.*, not carrying square topsail yards on the foremast. The cutter differs from the American sloop in carrying a sail, termed the foresail, on a stay from the masthead to the stem, the jib and flying jib being set on a long running bowsprit. The cutter, in fact, substitutes two head sails for one used in the sloop. The yawl differs from the cutter in carrying a slightly reduced mast and boom, the latter leaving room for a small aftermast, stepped close astern, whereon is set a lugsail sheeted home to the end of a running boom. In racing, the competitors use a large racing sail, called a spanker, set on a long beam projecting from the foot of the mast at right angles to the vessel. The sail, which is flat and triangular, extends from the topmast head to the deck, on the opposite side to that occupied by the main boom, though occasionally shifted to the bowsprit end. In 1851, the schooner *America* crossed the Atlantic and won the queen's cup from the *Aurora*. In the half century following, England has made eleven vain efforts to win back the cup, the most exciting and hardest fought race being the contest between the English *Genesta* and the American *Puritan*, in 1885. Great interest was roused by the last race between the Irish challenger *Shamrock II.* and the American defender *Columbia*, winner in 1901 of the cup which America has now won and held in twelve successive races.

Yak, an ox-like animal found in Tibet and central Asia. It is related to both the bison and the true oxen. In a wild state it is found on the high plateaus of Tibet, between the Altai and Himalaya mountains. It can at once be distinguished by the long hair, which hangs from each side like a curtain, and in some cases touching the ground. The hair is longer in the domesticated forms than in the wild ones. The tail is also very hairy, and the white tips are cut off by the Chinese, who dye them red and use them as tassels. There is a hump over the fore legs, and this is exaggerated by the hairy mane. The yak has been domesticated for centuries in Tibet, and is extensively used as a beast of burden. It feeds on grass, and one peculiarity of its feeding is that it refuses to eat corn. These animals are about the height of a small ox. The cows yield milk, and the skins of both cows and bulls are used for clothing.

Yakutsk (*yä-kötsk'*), the chief town of the government of that name in eastern Siberia. It is situated on the left bank of the Lena river, 5,000 miles from St. Petersburg. The whole industry of the town consists of candle works; but it is nevertheless the principal market of eastern Siberia for traffic with the native tribes of Jakuts and Buriats. Population 5,800.

Yale, Eli'hu, after whom Yale college (now Yale university) was named, was born at New Haven, Conn., April 5, 1648. At the age of ten years his parents returned to England, and he never returned to America. In the year 1678, he went to the East Indies, where he remained several years and accumulated a large fortune. On his return to England he became governor of the East India company and a fellow of the Royal society. His gifts to the new institution in books and money amounted to about $4,000, in consequence of which it was named Yale college. He died at London, July 8, 1721.

Yale University, located at New Haven, Conn., is one of the oldest and most famous of educational institutions in the United States. It was founded in 1701 as the Collegiate School of Connecticut, and was located at Saybrook until 1716, when it was removed to New Haven. In 1718, the name of the school was changed to Yale college, in recognition of

large gifts from Elihu Yale of London. This name was changed by statute to Yale university in 1887. Besides the academical department, still designated as Yale college, it has Sheffield scientific school, a graduate school, divinity school, medical school, law school, school of art, and school of music. In all its departments it is thoroughly equipped and amply endowed. Its libraries contain more than 300,000 volumes. The faculty numbers 275, with an attendance of 2,542 students in 1901.

Yam, the tuberous root of a species of *Dioscorea*, a genus of climbing vines chiefly displayed in the tropics, where they are extensively cultivated for food. The name has been also wrongly applied to certain forms of the sweet potato.

Yan'cey, William Lowndes, a highly distinguished southern orator, was born at Ogeechee Shoals, Ga., Aug. 10, 1815. After receiving a collegiate education he was admitted to the bar in Abbeville, S. C., but in 1836 moved to Alabama, where he successively edited the Cahawba *Democrat* and the Wetumka *Argus*. He was a member of congress in 1844–47, and in all the events leading to the secession of the southern states was one of the most prominent and perhaps the most eloquent leader of the pro-slavery party — the extent of his influence in "firing the southern heart" and inducing the effort to secede being hard to overestimate. When the war broke out, he was sent to Europe as the agent of the Confederate government, but failed to secure its recognition by any of the European powers. On his return home, he became a member of the Confederate congress, and died near Montgomery, Ala., July 28, 1863.

Yang-tse-Kiang (*yăng'tse-kĭ-ăng'*), the principal river of Asia, the "girdle of China," connecting all the central provinces of that empire situated between Tibet and Koko-Nor on the west and the Pacific ocean on the east. Its entire length through all its numerous windings under various names cannot be less than 3,000 miles. To name the cities on the banks and tributaries of this rival of the Mississippi would be to enumerate a large portion of the cities of the empire. It is navigable by the largest vessels to 900 miles from its mouth and by smaller ones for a much greater distance.

Yan'kee, the popular name for a New Englander in America, and in Europe often applied indiscriminately to the entire population of the United States, was, in its origin, a corruption of the word *English* as pronounced by the Indians — *Yenghies*, *Yanghies*, *Yankees*. It seems to have been first applied by the British soldiers to the New Englanders as a term of reproach during the Revolutionary war. During the Civil war, it was applied by the southern people to all the inhabitants of the northern states.

Yan'kee Doo'dle. This popular air was originally *Nankee Doodle*, and is as old as the time of Cromwell. It was known in New England before the Revolution, and is said to have been played by the English troops in derisive allusion to the then popular name of the New Englanders; and afterward the New Englanders adopted the air.

Yank'ton, a city of South Dakota, stands on the north bank of the Missouri river, about 1,000 miles above its junction with the Mississippi. Three lines of railway pass through the city, which is also connected by steamer with various points on the river. Population 4,125.

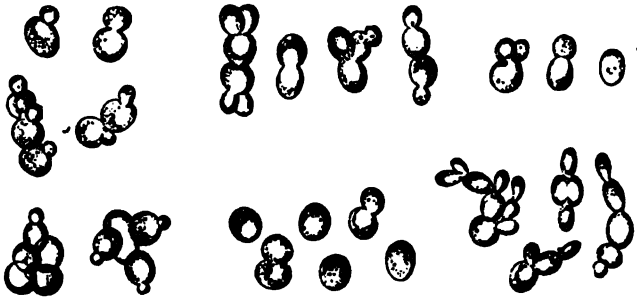
Yard, The Impe'rial, is the British standard of length, being the distance between two parallel lines on gold studs (or plugs) driven into a bar of bronze, deposited at the Standard's Office in London and used at a temperature of 62° F.

Yates, Edmund Hodgson, English novelist and dramatic critic, was born at London in the year 1831, and after serving for a number of years in one of the departments of the London post office, retired in 1872. He successively edited *Our Miscellany*, *Temple Bar*, and the *World* newspaper, besides writing several novels and dramas. He died at London, May 20, 1894.

Yates, Richard, was born at Warsaw, Ky., Jan. 18, 1818, and after being graduated at Illinois college, studied law and was admitted to the bar. He served a number of terms in the Illinois legislature, and during the Civil war was governor of that state, in which position he won a very enviable reputation for zeal and patriotism as well as for the vigor and efficiency he manifested in organizing and equipping the troops of his state. So great was his popularity with the people of Illinois, among whom he was familiarly known as "Dick" Yates, that as soon as his term as governor expired, he was chosen to a seat in the United States senate, which he filled till March 4, 1871. He died at St. Louis, Nov. 27, 1873.

Ya'zoo, a river of Mississippi formed by the union of the Tallahatchie and the Yallobusha, runs southwestward in a very serpentine course in a deep, narrow, sluggish channel — its length being about 300 miles — and empties into the Mississippi, ten or twelve miles above Vicksburg. In the winter of 1863–64, General William T. Sherman sailed up the Yazoo with a considerable military force, for the purpose of capturing the fortified position of "Haines' Bluff" from the Confederates, preparatory to an attack on Vicksburg, but the expedition was unsuccessful.

Yeast, the common name of species of *Saccharomyces*, a genus of low plants (fungi) probably belonging to the Ascomycetes (which see). The yeast plant is a single very simple cell, which produces new cells by a peculiar budding process. Usually the cells thus produced cling together in short chains. The most generally known of the twenty-five described species is *S. cerevisiæ*, the yeast used by brewers and bakers. The use of yeast is due to its great activity in the process of fermentation. When placed in sugar-containing solutions and exposed to a proper temperature, the cells multiply with great rapidity, and in their living cause the sugary solution to "sour." In this "souring" process the gas — carbon dioxide — is given off, and if it is held by some tenacious substance, as dough, it will puff it up, that is, make it "light." The process of adding yeast to dough is simply sowing yeast plants that they may grow.



YEAST, SHOWING THE REPRODUCTION BY BUDDING.

Yed'do. See TOKIO.

Yel'low Bird, the name in general use for two different birds of the United States. One of them is the goldfinch, which is one of our most attractive birds. It is about five inches long, and in the summer has a yellow body, with black on the crown, and black and white on the wings and tail. It is also a winter resident, but the winter dress is different, being grayish brown, with a yellowish crown and soiled white below, and a yellowish throat. The name is also given to the yellow warbler, which is also locally called the "wild canary." See GOLDFINCH, and WARBLER.

Yel'low Sea, an important inlet of the Pacific ocean, washes the northeast coast of China, and is bounded on the west by the Chinese provinces of Shangtung and Keang-su, and on the east by the peninsula of the Korea and Japan. It is more than 600 miles in length, and about 400 in average breadth. Its waters are shallow and are gradually becoming more so, owing to the deposits of earth borne down into it by the Hoang-ho and the Yang-tse-Kiang rivers.

Yel'low Springs, a village of Greene county, O., seventy-five miles from Cincinnati, on the Springfield branch of the Panhandle railroad. It is situated in the midst of a fine agricultural region and is chiefly noted as being the seat of Antioch college, a Unitarian institution, of which the distinguished Horace Mann was the first president. Population 1,377.

Yel'lowstone, a river of the United States, rises in a beautiful lake of the same name high up in the Rocky mountains, and, receiving numerous branches from the south, flows northeasterly through the territory of Montana and empties into the Missouri river, in the state of North Dakota, in 48° north latitude and 104° west longitude. It is 800 yards wide at its mouth, is 1,000 miles long, and is navigable for 700 or 800 miles. The Grand Cañon of the Yellowstone is 3,000 feet deep, and to one looking up from the bottom stars are visible in broad daylight. The grandeur of the cañon is at once heightened and diversified by the upper and lower falls, the latter being one unbroken symmetrical expanse, 350 feet in height. The beautiful lake from which the river issues is about 300 square miles in area, and is situated between 7,000 and 8,000 feet above the level of the sea.

Yel'lowstone National Park, a tract of country sixty-two miles in length and fifty-one miles in breadth, situated mainly in the northwestern part of the state of Wyoming, which has been withdrawn from settlement by action of the United States government and set apart as a public park. The area of the national reservation is 3,412 square miles, exclusive of the area on the south and east of the park proper, set aside by congress as a forest reserve. Yellowstone park was created by an act approved in March, 1872, and is under the supervision of the secretary of the interior. Leases were in 1889 granted by the national government to the Yellowstone Park association, to erect at certain suitable points hotel accommodation for visitors to the park, and to maintain a naphtha launch on Yellowstone lake, conformable to certain restrictions. Government has also provided that care shall be taken of the remnant of our North American fauna and of the ruminants of the western plains and mountains, together with such fish as may live in the waterways of the park outside of the geyser region. The park abounds in scenery of unparalleled grandeur. It is a region of hot springs and geysers, mountains and cañons, lakes and waterfalls. Its surface is mainly an undulating plateau, with a mean elevation of 8,000 feet above the level of the sea, upon the surface of which flow the minor streams, while the larger ones have cut cañons for

themselves, several of them of great depth. The eastern portion, however, is occupied by a mountain chain, known as the Absaroka range, peaks of which rise to heights exceeding 11,000 feet. These mountains, which separate the waters of the Yellowstone from those of the Big Horn, are unsurpassed by any in the United States for grandeur and sublimity of scenery. Another group of mountains, in the shape of a horseshoe, known as the Washburne mountains, occurs in the middle of the park, the highest peak of which has an elevation of 10,000 feet. The Red mountains are in the southern part, their culminating peak, Mt. Sheridan, being likewise about 10,000 feet in height.

The park has an abundant rainfall and its streams are numerous and bold. Within its area are the sources of the Yellowstone and the Madison, which go to make up the Missouri, and of the Snake, one of the forks of the Colorado. It also contains many beautiful lakes and ponds. A convenient way of reaching the park from the east is by the Burlington route from Chicago, via St. Paul (Minn.), and Bismarck (N. Dak.), to Livingston (Mont.), thence southwest to Cinnabar, and from there by stage through the park. From St. Louis, Kansas City, and from Burlington (Ia.), the Burlington route, via Omaha, is also available, the entrance being also by way of Livingston (Mont.) and Cinnabar, on the northwestern boundary of Wyoming. From Cinnabar a daily stage sets out for the Mammoth Hot springs, by way of Gardiner, a distance of six miles, where good accommodation for sight-seers is to be had, as well as at convenient points in the five days' staging throughout the park, under a franchise from the United States government. From Mammoth Hot springs the stage route embraces the Norris geyser basin, the Lower geyser, the Upper geyser, and the Lake geyser, at the west arm of Yellowstone lake (over which a steamboat now plies), thence on the return route by way of the Grand Cañon and the Falls of the Yellowstone. The roads throughout are good, being maintained by the government.

Yenisei (*yĕn'e-sā'ē*), one of the largest rivers of Siberia, formed by the junction of the Onlon-Keme and the Bey-Keme, which rise in the mountains on the southern border of the country. It flows northward through the center of Siberia into the Arctic ocean, forming at its mouth a long estuary. In the earlier part of its course it is interrupted by falls and rapids, but afterward flows through a great plain or steppe, receiving many tributaries, its total length being over 3,000 miles.

Yes'so, the most northerly of the four principal islands which compose the empire of Japan. This island is mountainous with volcanoes; it is rich in fine timber and valuable minerals, especially coal, and the rivers and coasts abound in fish. Area of Yesso, or Yezo, 36,299 square miles. Population 460,155.

Yew, the common name of species of *Taxus*, a genus of Conifers, distributed throughout north temperate regions. The most noticeable peculiarity of the genus is the development of a fleshy (usually scarlet) cup ("aril") about the naked seed, making the fruit look like an open berry. The common yew of Europe (*T. baccata*) is very often cultivated, especially in cemeteries. The American *T. Canadensis* is a more or less prostrate form, which is especially abundant northward.

Yokohama (*yō-kō-hä'mä*), a town of Japan on the island of Niphon. In 1854, it was only a small fishing village, but after it supplanted Kanagawa as the treaty port of Yeddo in 1859, it rapidly increased. Since the recent changes in the policy of the Japanese government, great improvements have been made; and broad and cleanly streets have taken the place of the former narrow and dirty thoroughfares. Population 193,762.

Yonge, Charlotte Mary, English novelist, was born in Hampshire, England, in the year 1832. The novel by which she is best known, although she has published several others, is *The Heir of Redclyffe*. She is said to have devoted large sums accumulated from the sale of her writings to the aid of religious missions in New Zealand.

Yon'kers, a city of Westchester county, N. Y., on the Hudson river, immediately north of New York city. It was incorporated as a village in the year 1855; and in 1872 the town was divided, the northern portion becoming the city of Yonkers and the southern portion becoming a part of the city of New York. The city annually expends the sum of $190,202 on its public schools, which have a force of 160 teachers and an attendance of 7,036 pupils. Population 47,931.

York, a city of Pennsylvania, on Codorus creek, 100 miles west of Philadelphia, and 60 miles from Baltimore. The Northern Central railroad passes through the city, and it is also the western terminus of the Peachbottom railroad. Among its manufactories are car shops, a shoe factory, the Codorus paper mills, etc. In addition to public schools, it contains an academy for boys and a coeducational institute. The Continental congress sat here during the British occupancy of Philadelphia in the Revolutionary war. Population 33,708.

York, a city of England, situated at the junction of the Ouse and Foss rivers, nearly equidistant from London and Edinburgh. York is the most ancient of British cities. Before the Roman invasion it was one of the chief towns of the Brigantes, the most numerous and powerful of the British tribes; and during the Roman dominion it was a city of the first importance. Here Hadrian lived and Severus died. Here, too, died Constantine

Chlorus, and, as many suppose, here Constantine the Great was born. When the Roman emperors visited Britain, York was their chosen residence, as it was the residence of the imperial legates when the emperors were absent. The first English parliament was held at York in 1160 by Henry II., and in the immediate neighborhood of the city, Fairfax conquered Prince Rupert on Marston Moor during the civil war. The city and castle, already besieged, surrendered to the parliamentary forces a few weeks after. The educational institutions of York are both numerous and useful. Notable among them are St. Peter's school, founded in 1557; Archbishop Holgate's free school, dating from Henry VIII.; the Blue Coat school for boys and the Gray Coat school for girls, and the Yorkshire school for the blind, conducted in a palace originally built for the lord president of the council of the north. Population 76,004.

York, H. R. H., **George,** Duke of, second son of King Edward VII. of England, and heir-apparent to the British throne, was born at Marlborough house, London, on June 3, 1865. With his elder brother, the late duke of Clarence, he entered the navy as a cadet in June, 1877, and spent a number of years in the service, his latest command being on H. M. S. *Crescent*. His royal highness has been in most parts of the world and done duty in various stations of the British fleet. In 1892, he became heir to the throne and in 1901 was created Prince of Wales. In 1893, he married Princess Victoria Mary, of Teck. By her, he has four children, the eldest, Prince Edward, was born in 1894. In 1901, accompanied by the duchess of York, the duke of York paid a state visit to Australia, New Zealand, and Canada; the visit to Australia being designed to commemorate the opening of the first parliament of the new Australian Federation or Commonwealth.

DUKE OF CORNWALL AND YORK.

York, a river of Virginia formed by the Pamunkey and Mattapony, flowing southeast to the Chesapeake bay, nearly opposite Cape Charles. It is forty miles long and from one to three miles wide.

York, House of, was founded by Richard, duke of York, who claimed the throne of England in opposition to Henry VI., but never succeeded to it himself. After seeking for many years to correct the weaknesses of Henry's government, Richard first took up arms against the ill advisers who were his personal enemies, and at length claimed the crown in parliament as his right. A compromise was proposed that Henry should retain his crown during his life, and the duke and his heirs should succeed after Henry's death. This was accepted by both Henry and Richard, but the act passed to that effect was repudiated by Queen Margaret and her followers, and the duke was slain at the battle of Wakefield soon after. In little more than two months, however, Richard's son was proclaimed king in London as Edward IV. and the bloody victory of Towton soon after drove his enemies into exile, and prepared the way for his coronation. Edward reigned from 1461 to 1483, when his eldest son, Edward V., after a nominal reign of two months and a half, was put aside and murdered by his uncle, Richard III. Richard then became king; but in a little more than two years was defeated and slain at Bosworth (Aug. 22, 1485) by Henry Tudor, earl of Richmond, who was crowned as Henry VII. and whose marriage with the daughter of Edward IV. (1486) united the houses of York and Lancaster.

York'town, a city of Virginia, on the York river, ten miles from its mouth and about sixty miles from Richmond. Yorktown is noted for the surrender of Lord Cornwallis and his army to Washington, in the year 1781, which was the virtual close of the Revolutionary war, and for the unsuccessful siege of the place made by General McClellan in the spring of the year 1862.

Yosemite (*yō-sem'i-te*), a valley in Mariposa county, Cal., on the western side of the Sierra Nevada, about 150 miles from San Francisco, unequaled for the grandeur and magnificence of its scenery. It is seven or eight miles long and about a mile wide, and is about a mile below the level of the surrounding region. Of its various waterfalls the Bridal Veil is particularly noted for its beauty, and also for its height, which is nearly 1,000 feet. This valley, which was first entered by white men in 1855, is now attracting visitors every year from all parts of the world. Perhaps nowhere else on the face of the earth is there such a remarkable combination of beauty and sublimity.

Youmans (*yō'mans*), **Edward L.,** a distinguished American scientist, was born at Coeymans, N. Y., June 3, 1821, and although suffering for some years from almost total blindness, he pursued his studies in physics and chemistry with marked zeal and proficiency, his sister conducting experiments for him. Among the works for which he is distinguished are *Class Book of Chemistry*, *Correlation and Conservation of Forces*, *Alcohol and the Constitution of Man*, *Handbook of Household Science*, *The Culture Demanded by Modern Life*, etc. In 1872, he established *The Popular Science Monthly*, a magazine which has attained a very wide circulation in

both America and Europe. He died at New York, Jan. 18, 1887.

Young, Brigham, the noted head of the Mormon church, was born at Whittingham, Vt., June 1, 1801. In 1832, having become a convert to Mormonism, he was made an elder of the church, and began to preach at the Mormon settlement at Kirkland, O. Three years later, he was sent as a missionary to the New England states, where he succeeded in making quite a number of converts. After the death of Joseph Smith, at Nauvoo, Ill., in 1844, Young was chosen president in his place. In 1848, he led his followers to Utah and founded Salt Lake City, where for several years he reigned supreme and bade defiance to the United States government in its efforts to abolish polygamy. He died Aug. 29, 1877, leaving a fortune of $2,000,000 to be divided among seventeen wives and fifty-six children.

Young, Charles Augustus, a distinguished American astronomer, was born at Hanover, N. H., Dec. 15, 1834. He was educated at Dartmouth college, where he graduated in 1853. After teaching classics for three years at Phillips Andover academy, he went to the Western Reserve college in Ohio, where he taught astronomy, natural philosophy, and mathematics. For three months during the Civil war he served in the 85th Ohio volunteers. At the close of the war, he was appointed to the chair of physics and astronomy at Dartmouth, a position which his father had held some years earlier. During the following twelve years, Professor Young made a brilliant series of discoveries in solar physics, among which may be mentioned the "reversing layer" of the solar atmosphere, observed at the Spanish eclipse of 1870, the rotation period of the sun measured on Döppler's principle, the bright line spectrum of the chromosphere (1872), the motion and forms of solar prominences. In 1877, he was called to the chair of astronomy at Princeton university, which (1901) he still fills. He is now the highest living authority on the Sun. It is needless to say that he has received many honors, such as election to the National Academy of Sciences, degrees, and honorary memberships. His published works include *The Sun* (in the "International Scientific" series), *A General Astronomy*, *Lessons in Astronomy*, etc.

Young, Edward, English poet, was born in the year 1681, at Upham, in Hampshire, where his father was then the rector. He was educated at Winchester school and afterward at Oxford. He published several poems and tragedies, but the work by which alone he is remembered is *Night Thoughts*, which has passed through a great many editions, and is more or less familiar to the general reader in both England and America. A number of his sententious lines have passed into common use and become in a manner proverbial. He died April 12, 1765.

Young Men's Chris'tian Asso'ciation. This is an organization having a branch in most of the leading cities (and in some smaller towns) in the United States, Great Britain, and other countries, whose special object is to promote the welfare of young men. The condition of active membership in this organization is membership in some evangelical church; but young men not members of churches are admitted as associate members, and are entitled to all the privileges of the association, except a voice in the election of its officers. In addition to various religious services, the association generally provides a library and reading-room (open to the public), a gymnasium, bathroom, lectures, special instruction, proper amusements, etc.; and its power for good has been demonstrated so clearly as to command universal recognition. The first association organized in the United States was at Boston in the winter of 1851–52, but on account of the Civil war the growth of the institution hardly began until the year 1866. In 1901, there were 609 associations in cities and towns, 577 in universities and colleges, 161 among railroad men, 321 with the army and navy, 86 among the negroes, and 43 among the Indians, making a total of 1,797 associations, with 316,710 members. In 400 associations, special work was carried on for boys. They owned 1,027 buildings valued at $30,500,000, with 412 libraries, containing 415,385 volumes; and there were 1,609 secretaries at the heads of the various branches.

Young, Thomas, an eminent man of science, was born at Milverton, England, in 1773; and died at London in 1829. He was born of a well-to-do Quaker family, inherited ample money, and was widely educated, not only by university, study, but also by travel, leisure, and good society. He was a student successively at London, Edinburgh, Göttingen, and Cambridge.

Having completed his medical studies at Cambridge in 1800, he at once settled in London as a practicing physician. But in the year following he was appointed to the professorship of natural philosophy in the Royal institution. It was during his two years' occupancy of this chair that he published his most important memoir, namely, the one in which he shows that two rays of light may be added together to produce darkness—the phenomenon of *interference*. It was during this period also that he wrote his *Lectures on Natural Philosophy*, a work which exerted a powerful and healthful influence on physical science during a full half-century. His contributions cover a very wide field, including such subjects as physiology, music, hydrodynamics, paleography, theory of structures, tables of mortality, etc. His theory of color-vision, as modified by Helmholtz, is, perhaps, to-day as widely accepted as any of the various views which have been expressed upon this subject.

Dr. Peacock has published an interesting *Life of Young* (London: 1855), and has edited his *Miscellaneous Works* (London: 1855). But all of Young's more important contributions are reprinted in his *Lectures on Natural Philosophy*, 2 vols. (London: 1807).

Young's Mod'ulus. See ELASTICITY.

Young Women's Christian Association is an organization which seeks to help young women by providing for their physical, social, mental, and spiritual wants. The means used are Bible training classes, evangelical meetings, personal religious work, libraries and reading rooms, classes in various studies, and musical and literary entertainments, socials and receptions in home-like rooms, helpful companionships and holiday excursions, and there is a special department for young women of colleges. In 1891, there were 1,000 associations in Great Britain; 50 on the continent of Europe; 20 in India; 25 in Australia; 225 in America; other places, including China and Japan, 175; total in the world, 1,500. In 1901, there were in America 74 city and 409 student associations, with a membership of 49,175. The international association was formed in 1886. The work is controlled by an international committee of forty-six members. Twenty-one states had organized state associations in 1901. The state associations hold conventions yearly, and the international convention meets every two years. The *Evangel* is a monthly organ of the associations, published at Chicago.

Young'stown, a city in northeastern Ohio, on the Mahoning river, about sixty miles from Cleveland and the same distance from Pittsburg. Being situated in the midst of a coal and iron region it has become a very important manufacturing center, having several rolling mills, blast furnaces, etc. Population 44,885.

Ypsilanti (*ĭp'sĭ-lăn'tĭ*), a city of Michigan on the Michigan Central railroad, thirty miles west of Detroit. Considerable manufacturing is carried on, and it is a prominent educational center, being the seat of the Michigan State Normal school, one of the leading educational institutions of the country. Population 7,378.

Yucatan (*yō'kä-tan'*), a peninsula of Mexico, bounded on the west and north by the gulf of Mexico, on the east by the Caribbean sea, and on the south by Guatemala, and comprising the states of Yucatan and Campeche. The east coast is indented with numerous bays, some forming excellent harbors. The face of the country is low and level, except in the east, where there is a chain of hills extending from northeast to southwest. The only important river is the Usumasinta. The soil in some portions is very fertile, yielding abundant crops of maize, rice, tobacco, sugar cane, and other agricultural products. According to a law that is now enforced, education is free and compulsory. The primary schools, though mainly supported by the states and cities, receive government grants, and there are secondary schools, seminaries, and colleges for higher education. The area of the peninsula is 53,290 square miles. Population 384,352.

Yucca (*yŭk'ka*) **Moth,** a small moth which gathers pollen and fertilizes the yucca plant. A very remarkable relation has been shown to exist between this moth and the plant. The yuccas are lily-like plants, of which the Spanish bayonet is an example. The stamens are so placed that the pollen cannot get into the tube of the stigma without artificial aid. The plant is sterile without the moth, and the larvæ of the latter feeds on the seeds, so that in fertilizing the plant, the mother moth is providing for her offspring. The female moth (*Pronuba yuccasella*) is about one-half inch long, of a silvery white color. She begins her operations after dark, and in setting about to provide for the future generation, she first collects a pellet of pollen with her jaws and fore legs. She then begins to deposit eggs in the walls of the unripe fruit-pod, using her lance-like ovipositor to penetrate the outer covering. She then goes to the tube of the stigma, which leads into the fruit-pod and thrusts pollen down it, using her tongue to push the pollen toward the undeveloped seeds. The larvæ are hatched and feed upon the developing seeds, but as all of them are not consumed, the double purpose has been effected of fertilizing the plant and providing food for her young. See *The Yucca Moth and Yucca Pollination, Missouri Botanical Garden Report for 1892.*

Yukon (*yō'kon*), a river rising in the British possessions (in the Dominion of Canada) and flowing through Alaska into the Pacific ocean at Norton sound, its total length being about 2,000 miles.

Yu'ma, the southwestern county of Arizona territory, lying directly north of Mexico. It is intersected by the Gila river and is separated from California by the Colorado. The valleys, when irrigated, are fertile, but the rest is desert. Yuma, the county seat, with 1,402 inhabitants, stands on the east bank of the Colorado river.

Yu'mas, a tribe of American Indians, very small in number, occupying the territory on both sides of the Colorado, near its junction with the Gila.

Z

Zacatecas (*zăk-a-tā'kas*), capital of the Mexican state of that name, is situated in a deep valley or ravine, somewhat over 300 miles from the City of Mexico. It is built over a vein of silver which has been deeply explored. The streets are somewhat narrow and crooked but it has a fine appearance from a distance, owing to the size and massiveness of its churches, and the elegance of many of its residences. Population 39,912.

Zambesi (*zăm-bā'zē*) **River and Region,** the extensive region in southeast Africa known to mediæval geographers under the general name of the empire of Monomotapa, is shown on old maps as drained by a river, called Zambese or Zambere, which is plainly the modern Zambesi. Although the lower region of the Zambesi, for a distance of at least 300 miles from its mouth, has been nominally in possession of the Portuguese since the beginning of the 16th century, yet it is only within the last half of the 19th century, through the reports of Dr. Livingstone and other explorers, that we have any definite knowledge of this vast region, the total length of which cannot be less than 1,200 miles. The river bears the name of Zambesi from its mouth to its junction with the Chobe; thence to its junction with the Leeba, coming form Lake Dilolo, it is called the Leeambye. Part of the upper basin of the Zambesi was explored by Major Serpa Pinto in 1878–79. In the region where the Leeba joins the Leeambye, the main stream is 200 or 300 yards wide, and quite deep. From the confluence to Victoria falls there are many long tracts that could easily be plied by large steamers. Lake Dilolo, from which the Leeba flows, seems to have an outlet both to the north and the south, the northern outlet probably running into one of the tributaries of the Congo. Large areas in this region are liable to be flooded and to stand under water for considerable periods at a time. The Victoria falls are estimated to be about 2,500 feet above the sea level, while Lake Shirwa, a smaller lake southeast of Nyassa, is 2,000 feet. The natives inhabiting the coast region drained by the Zambesi are of the pure negro type, while the Makololo, who were found in the central and upper country, belong to the Betjuana family. According to Major Pinto, this tribe has now ceased to have a separate existence. On the Upper Zambesi, Pinto discovered a tribe of Ethiopian origin, of a yellowish white color. The Zulu tribe, who inhabit the high region dividing the Limpopo from the Zambesi basin, have overrun and conquered nearly all the tribes south of them. The possession is governed by the Mozambique and Nyasi companies, and the Zambezia company carries on industrial, commercial, agricultural, and mining operations, while the Mozambique Sugar company has plantations on the Lower Zambesi. The military force of the colony is 4,888 men, three-fourths of whom are natives.

Zanes'ville, a city of Ohio, on both sides of the Muskingum, at the mouth of the Licking, fifty-five miles east of Columbus, is situated in a beautiful and fertile valley, and is crowded with manufactures and other business enterprises. Having fine railroad and river facilities, it is a prosperous and busy city. It has rolling mills, blast furnaces, brass and iron foundries, glass and soap factories, flour, woolen, and paper mills, railroad and other machine shops, and tile works for roofing and flooring. In addition to fine public schools, it is the seat of the Putnam Female seminary, and a Catholic institution. Zanesville was settled in 1799, and was the state capital from 1810 to 1812. Population 23,538.

Zanzibar (*zăn'zĭ-bär*) or **Zanguebar,** a sultanate under British control, comprising all that part of the east coast of Africa between Magdashova, situated in 2° north latitude, and Cape Delgado in 10° 42′ south latitude, the extent of the coast being about 1,000 miles. Parallel to the coast are numerous islands, the most important of which are Zanzibar, Pemba, and Monfia. The territories toward the interior have no defined limit, being occupied by heathen tribes, over whom the sultan has hardly even a nominal authority beyond the seaboard. The island of Zanzibar, about 50 miles in length and from 15 to 30 miles in breadth, is the most important of the sultan's dominions. It contains an area of 640 square miles, and the soil in most parts is exceedingly fertile. The principal products are cocoanuts, cloves, rice, sugar cane, fruits, etc. The population of the island is estimated at 150,000, and that of Pemba at 50,000, among them many foreigners, for the most part engaged in trade. The town of Zanzibar has about 30,000 inhabitants. The soil along the coast is fertile in rice, millet, peas, beans, melons, pumpkins, sugar cane, cocoanuts, bananas, etc., and the forests supply many valuable species of timber. Cattle, sheep, and fowls are plentiful, and wild animals also abound. The heat on the coast is excessive, and the climate is unfavorable to Europeans and Americans.

Ze'bra, a striped animal of Africa related to the wild ass. The true, or mountain zebra, inhabits mountainous regions in Cape Colony. Owing to the persecution of hunters, it is now scarce and fast becoming exterminated. It is about four feet high at the shoulders. Its general color is white, with black stripes on the body, the limbs, and the tail. Those on

the limbs extend to the hoofs and those on the tail to the tuft of hair. Burchell's zebra is a larger and more robust animal, with a longer mane and a fuller tail. Its general ground color is pale yellowish brown. The stripes

ZEBRA.

are dark brown or black, but do not extend so far on the limbs and on the tail as they do in the mountain zebra. The zebra has never been successfully domesticated. The flesh is eaten by the natives, their hide is used for the leather. The quagga is not a true zebra. See QUAGGA.

Ze'bu, the name sometimes used for a humped ox of India (*Bos Indicus*). This name, however, is not used in India, it is an invention of foreign people. The zebu is closely related to the domesticated ox. It is no longer found in the wild state. The animal possesses a well-marked hump of fat on the shoulders, which is considered a delicacy for the table. They have long ears pointing downward and very short blunt horns. The cows are milked. These animals are used in plowing, for drawing carriages, riding, etc. Similar animals are found in China and east Africa. The sacred bulls of the Hindus belong to this species.

Zechari'ah, one of the ancient Hebrew prophets, was born in Babylonia during the captivity, and accompanied the exiles on the return to Jerusalem under Zerubbabel and Joshua. Very little is known of his history, but there is enough to show that he was a man of great influence, and combined in himself the offices of priest and prophet. The prophecies of Zechariah may be divided into three parts. The first eight chapters consist mainly of a series of visions relating to the building of the temple and the glory that shall follow to Jerusalem; the second portion, chapters ix–xi, threatens Damascus and Phœnicia with ruin, predicts that Judah will be greater than Javan (Greece), and that both Egypt and Assyria will be humbled; while the remaining portion sets forth that dark times are before Judah, which shall be as an ordeal for the nation, after which a millennium of holiness will be ushered in. "In that day there shall be upon the bells of the horses, *Holiness unto the Lord;* and the pots in the Lord's house shall be like the bowls before the altar. Yea every pot in Jerusalem and in Judah shall be holiness unto the Lord of hosts."

Zee'man Effect, a phenomenon discovered by Zeeman of Holland in 1897. This important relation between light and magnetism is as follows: Zeeman found that if a flame colored with ordinary table salt — the so-called sodium flame — is placed between the poles of a strong electro-magnet and examined with a powerful spectroscope, the appearance of the sodium lines is very much changed. Later investigations show that spectral lines are tripled when the source of light is in a magnetic field, and that the components of the triplet are polarized. For details, see article by Michelson, in *Astrophysical Journal*, Vol. VII, pp. 131–8 (1898).

Zeis'berger, David, a Moravian missionary, born in Moravia, April 11, 1721, who, after emigrating to America and living in Georgia a number of years, became one of the founders of the Moravian colony at Bethlehem, Pa., in the year 1740. Soon after this he became a missionary to the Indians, laboring among them very zealously at various places in the state. In 1772, he explored the Tuscarawas valley in Ohio, and laid out a town, about ten miles from the present town of Canal Dover in that state, being joined soon after by a number of Moravian Indians from Pennsylvania. In 1781, this settlement was broken up, and Zeisberger and his Indians were compelled to move to Sandusky, but in 1798, when congress granted to the Moravian Indians the tract on which they had formerly lived on the Tuscarawas, a portion of them returned and formed a new settlement, which they named Goshen, where Zeisberger died Nov. 17, 1808.

Zend-Aves'ta. See LITERATURE, PERSIAN.

Zen'ith. See NADIR.

Ze'no, founder of the Stoic philosophy, was born at Citium, in Cyprus, the date of his birth and death being both uncertain. He flourished in the early part of the 3d century B. C., and was a contemporary of Epicurus. At the age of thirty he was shipwrecked, and having lost his property adopted the doctrines of the Cynics, in which contempt for riches is conspicuously taught. Having made himself master of the various schools, he proceeded to open a school of his own, wherein he might bring forth the results of his inquiries and develop his own peculiar system. He selected for his purpose the "Painted Porch"; and there until his death continued to teach those doctrines which, in spite of many objectionable features, inculcate the manly

energy and simplicity, the patience and fortitude, and that reverence for moral worth which made disciples of so many noble Roman characters. The Athenians honored Zeno's memory with a golden crown and a public burial, and his countrymen erected a monumental pillar in his honor. Scarcely any portion of his numerous writings have been preserved. He is supposed to have died about 264 B. C.

Zeno'bia, queen of Palymra, in the year 267 A. D., succeeded her husband Odenathus, who had been acknowledged by Gallienus in the sovereignty of the Roman Empire; but when Aurelian became emperor he marched against her with a large army, and after defeating her in several battles besieged her in Palmyra. She attempted to escape by flight, but was captured and brought to Rome to adorn the triumph of her conqueror. After this she was presented by Aurelian with large possessions near Tivoli, where the remainder of her life was passed. She was a woman of great courage, high spirit, and remarkable beauty, and, with purity of morals in private life, she combined prudence, justice, and liberality in her administration of public affairs.

Zeus (*zūs*) was the greatest of the Grecian deities. According to the most generally received mythology, he was the son of Cronos and Rhea, and the brother of Poseidon and Hera, the latter of whom was also his wife. He expelled his father and the older dynasties of the Titans, assumed the sovereignty of the world, and successfully resisted the attacks of the giants and the conspiracies of the gods. After the dethronement of the Titans, Zeus was allotted the empire of heaven and air, Hades of the infernal regions, and Poseidon of the sea, while the earth was left under the power of the three. Crete, Dodona, and Arcadia were the places where the worship of Zeus was most cultivated; and in process of time all the local gods worshiped under the name of Zeus were merged in one Hellenic divinity, who was afterward identified with the Jupiter of the Romans and the Ammon of Libya. Zeus was the father of gods and men, protector of kings, and the supporter of law and order, the avenger of broken oaths and other offenses; he watched over the state and the family, and over strangers and suppliants; his hand wielded the lightnings and guided the stars; he ordained the changes of the seasons, and regulated the whole course of nature. He dispensed both weal and woe to mortals; but the ancients disagreed as to his power over the fates themselves, as has always been the case when men have "reasoned high on fate, foreknowledge, and free will."

Zil'leh, a town in Asiatic Turkey, about thirty miles from Tokat. This was the scene of Julius Cæsar's battle with the Pharnaces, concerning which he wrote the famous report, "*Veni, vidi, vici*" (I came, I saw, I conquered). Scarcely any remains of antiquity are to be found in the place, a fortress of the middle ages having been constructed on the site of its beautiful temple. The town contains about 2,000 houses, the population being mostly Turkish.

Zinc (or *spelter*, as it is often called in commerce), is a hard, bluish-white metal, lustrous on its surface, and when broken exhibits a crystalline fracture. At ordinary temperatures it is somewhat brittle, but when heated above 212° it becomes very ductile and malleable, so that it may be drawn out into wire or rolled into thin plates. Since the discovery of this quality the uses of this metal, which was formerly chiefly employed in connection with copper in the manufacture of brass, have been greatly extended. It is used for roofing, spouting, baths, water tanks, and the like, also for covering ships' bottoms instead of copper. As a material for casting artistic works, zinc has the desirable properties of a low melting point, and of taking a sharp impression from the mould, so that it requires little labor from the chaser — it also possesses considerable hardness. It has, therefore, become a favorite material for making casts of statues and different kinds of ornaments. Another important use of metallic zinc is in the cells of electric batteries, in many of which the dissolving of the zinc is the source of energy. Zinc oxide, a white powder, is extensively used as a pigment, while other compounds of zinc, as the chloride and sulphate, are used in medicine.

Zi'on, Mount, the name of the hill on which stood the southwest part of Jerusalem, called the city of David or Upper City. At the present day the city wall runs obliquely over the hill, so that only the north half is included in the city. On the west side and still more on the south side it descends steeply into the vale of Hinnom to a depth of 300 feet. Mount Zion is 2,500 feet above the level of the sea. With the prophets and poets of the Old Testament it stands for the whole of Jerusalem (often called "Daughter of Zion"), particularly in reference to the temple.

Zis'ka, John, the famous leader of the Hussites, was born at Trocsznow, Bohemia, about the year 1360. While a mere boy he became a page to king Wenceslaus of Bohemia, but soon after embraced the career of arms and distinguished himself in the war against the Teutonic knights. Returning to Bohemia after the murder of John Huss, Ziska soon became prominent among those who sought to resist the decisions of the Council of Constance. After the outbreak at Prague, in the year 1419, Ziska was unanimously chosen leader of the Hussites, and the first great religious conflict in Germany was commenced in earnest. When the emperor Sigismund — the same who had allowed his safe-conduct to Huss to

be violated — advanced an army of 40,000 men into Bohemia, to obtain possession of the throne, his project was frustrated for a time by the Hussites, who defeated his army with a hastily levied force of 4,000 troops. The war against Sigismund was continued with the utmost vigor by Ziska, even after he became blind, until Sigismund became convinced that the conquest of Bohemia was impossible. He therefore proposed an arrangement with the Hussites, by which full religious liberty was allowed to them, and Ziska was to be their governor, King Wenceslaus having died soon after the war broke out. But the war-worn chief did not live to complete the treaty, for while besieging the castle of Przibislaw he was seized with the plague and died Oct. 11, 1424. He was buried in a church at Czaslav, and his iron war club was hung over his tomb.

Zo'diac, an imaginary zone of the heavens within which lie the paths of the sun, moon, and principal planets. It is bounded by two circles equidistant from the ecliptic — about 18° apart; and it is divided into twelve signs, and marked by twelve constellations. The signs are geometrical divisions 30° in extent, counted from the vernal equinox in the direction of the sun's progress through them. The whole series accordingly shifts westward through the effect of precession by about one degree in seventy-two years, requiring 25,868 years for a complete circuit. At the moment of crossing the equator toward the north the sun is said to be at the first point of *Aries* (Ram); some thirty days later it enters *Taurus* (Bull); and so on through *Gemini* (Twins), *Cancer* (Crab), *Leo* (Lion), *Virgo* (Virgin), *Libia* (Balance), *Scorpio* (Scorpion), *Sagittarius* (Archer), *Capricornus* (Goat), *Aquarius* (Water Bearer), *Pisces* (Fishes). The constellations bearing the same names coincided approximately in position when Hipparchus observed them at Rhodes, more than two thousand years ago, with the positions they designate. The discrepancy now, however, amounts to the entire breadth of a sign, the sun's path in *Aries* lying among the stars in *Pisces;* in *Taurus* among those of *Aries;* in *Gemini* among those of *Taurus*, etc. This gradual retrogression of the signs through the constellations of the zodiac will continue till they accomplish, in about 25,868 years, a complete circuit, after which period the sign and constellation of Aries will coincide as they did in the time of Hipparchus.

Zodi'acal Light. If an observer in the tropical regions of the earth on a clear, moonless night watches the western sky from sunset till the last trace of twilight has disappeared, he will notice that the twilight seems to linger longer near the point where the sun sank below the horizon, and that gradually a nebulous band of light, broad toward the horizon and narrowing first rapidly and then more slowly upward, begins to stand out clearly from the vanishing twilight, which spreads along a much wider arc of the horizon. This is the zodiacal light. When seen on a perfectly clear night, it will be noticed that it fades imperceptibly on both sides and toward the vertex, and that its light is distinctly brighter toward the base than at higher points. Its width at its base may be said to vary from 10° to 30°, and the height of its vertex from 40° to 90°. It is most clearly seen in our latitude during the spring months after sunset, and in the fall months before sunrise. This is not due to any change in the light itself, but to the fact that at other seasons of the year the ecliptic makes so small an angle with the horizon that light lying in or near it does not rise sufficiently high above the mists of the horizon to be seen after the twilight has vanished.

Zo'la, Emile, French novelist, was born at Paris, April 2, 1840, of a French mother and an Italian father, an eminent civil engineer. His distinguished son spent his boyhood at Aix, and was educated at the Lycée St. Louis. Settling in Paris, he was for a time in the employ of Messrs. Hachette, the well-known publishing firm. His first venture in fiction was *Les Mystères de Marseille*, and in this and in *Thérèse Raquin*, he at once displayed his remarkable power in the critical analysis of human character. Soon after this he formed with Flaubert, Daudet, and the Goncourts the naturalistic school of fiction, chiefly marked by a hideous though powerful delineation of the crimes, weaknesses, and loathsomeness of Parisian social life. The fruit in part of this was the series known as *Les Rougon-Macquart Family*, modelled somewhat after Balzac's *La Comédie Humaine*. The more notable subsequent stories are *L'Assommoir*, *Nana*, *Pot Bouille*, *La Joie de Vivre*, *Au Bonheur des Dames*, *Germinal*, *La Terre*, *La Bête Humaine*, *La Débâcle*, *Le Docteur Pascal*, whose nastiness is somewhat sweetened by *Le Rêve* (The Dream), and by a love-story, entitled *Lourdes*. The latter forms one of a trilogy, which he called Les Trois Villes — *Lourdes*, *Rome*, and *Paris* — all in the extreme realistic vein. His latest work, written in exile, occasioned by his courageous advocacy of the famous Dreyfus case, is entitled *Fécondité*. He is a knight of the French Legion of Honor, but has been refused admittance to a seat in the French academy.

Zone, literally a belt or girdle, a portion of the surface of a globe or sphere lying between any two circles of the same whose planes are parallel to each other, or that portion of the surface of a sphere cut off by the plane of a circle. As the earth's axis is inclined to the plane of the ecliptic, or the sun's apparent path around the earth, 23½°, the tropics of Cancer and Capricorn are located that dis-

tance north and south of the equator, respectively; and for the same reason the Arctic Circle and the Antarctic Circle are located 23½° from the north and south poles respectively. These circles are accordingly said to divide the earth's surface into five zones; to-wit, the North Frigid, lying north of the Arctic Circle; the North Temperate, lying between the Arctic Circle and the Tropic of Cancer; the Torrid, lying on both sides of the equator between the Tropic of Cancer on the north and the Tropic of Capricorn on the south; the South Temperate, lying between the Tropic of Capricorn and the Antarctic Circle, and the South Frigid, lying south of the Antarctic Circle. The area of a zone on any sphere is equal to the circumference of a great circle multiplied by the height of the zone.

Zoöl'ogy, the science of animal life. The scope of this subject has been greatly broadened in the latter half of the 19th century, and it has come to include questions that might not at first sight appear to have a direct connection with zoology. For example, certain discoveries (those of Von Lenhossék) on the nervous system of the earthworm opened the way to generalizations regarding the nervous system of higher animals, including that of the human body. Also, the studies of zoologists on cells are helping to solve broad questions of development and heredity. Thus, the science of zoology comes into direct relation with the work of the anatomist, physiologist, and psychologist. This relation is so close that medical schools are asking for a preparation in zoology as an introduction to medical studies. One impression that has gained wide currency should be corrected, *viz.*, that the chief business of the zoologist is to know the different kinds of animals and be able to name them. That is zoology of the past, and it has been replaced by a better kind of knowledge. Attention has been directed from the external appearances of animals, as shape, color, differences in horns, hoofs, etc., to their internal structure and life processes. An attempt is being made to analyze their vital activities, and to determine their position in the history of the universe. An examination of the text-books of a generation ago will show that emphasis was uniformly placed on the classification of animals. In this period, also, the museum collector and the hunter naturalist were dominant types of zoologists. It is quite true that students of zoology should not be drawn away from the fields, forests, and streams; nevertheless, that which is best and strongest in modern zoology is being worked out in the laboratory, by experiments and observations on a few forms. These studies, especially in the last half of the 19th century, are leading to large generalizations regarding the science of life, which should become known to all people of liberal culture.

Zoology as a science aims to give a picture of animal life on the globe, to consider its structure, to analyze its activities, to account for it by tracing its history in general and in detail, and to consider its relation to nature at large. The history of biology includes that of zoology, and the article on biology should be consulted, where a number of general considerations are entered upon that need not be repeated here.

The new way of looking at the animal world did not come all at once, but has been the result of growth. Knowledge regarding animal life has advanced by a series of steps, and its progress can be divided into a number of periods. The first of these is the period extending from the earliest writings about animals to the renaissance of science in the sixteenth century. Zoological study was cultivated among ancient peoples and reached its highest development in that period in the work of Aristotle, the Grecian philosopher-naturalist, who lived 384 to 322 B. C. He was a man of truly scientific mind and made many original observations on the structure and development of animal life. With him, classification was based upon structure, but was of secondary importance. His successors did not reach the level of the great "Father of Natural History," as he has been called. Their work took more and more the line of systematic classification of animals, and lost in observations on structure and development. Pliny the Elder (23–79) is the next prominent naturalist of antiquity. That Roman general and teacher has been unduly praised as a zoologist, for he was only a poor compiler, who mixed borrowed facts, fancy and fabulous stories. He replaced the natural classification of Aristotle by a highly artificial arrangement of animals, according to their place of abode, on land, in water, or air. It is noteworthy that nothing of importance was added to the work of Aristotle till the awakening of observation in the 16th century.

In the intervening period the intellectual life of mankind took a retrograde movement. Observations and inquiry into nature were discontinued and, in fact, were discouraged by the priesthood and other intellectual leaders. This led to mental imbecility and to superstition in reference to the natural universe. But an awakening came, and it was an epoch of unusual importance when men began once more to observe and experiment, and thereby lay the foundations of modern science. The new intellectual movement was led, in the 16th century, by Galileo, Descartes, and Vesalius. The work of Vesalius (1514–64) in anatomy had great influence upon the development of zoology (see ANATOMY). Progress in anatomy helped zoology by giving a knowledge of structure. At first, structural studies were mainly on the higher animals nearest man. Afterward, they were extended to other forms including the

invertebrates and made broadly comparative.

At the revival of learning the influence of Aristotle was mainly on the systematic classification of animals. His works were translated and extended by Wotton (1492–1555), Gesner (1516–65), Aldrovandi (1522–1605), and others who produced ponderous treatises on natural history written in Latin. These men, and their successors for about two hundred years, have been called the encyclopædists. The work of Gesner was of fine quality, and marks the beginning of careful observation and description of animals.

Passing over the notable work of naturalists like Malpighi (1628–94), Leeuwenhoek (1632–1723) and Swammerdam (1637–80) in the 17th century, who worked on minute anatomy and brought the microscope into use, we come to the period of natural history, characterized by the work of Ray (1628–1705), Linnæus (1707–78), and Buffon (1707–88). Ray laid the foundations upon which Linnæus built. The name of the latter is probably more widely known than that of any other naturalist. He was a man of prodigious industry, filled with a zeal for collecting and naming natural objects. He greatly extended the number of known animals and plants, but did little toward deepening the knowledge of animal life. His chief service was in systematizing the groups and introducing the method of naming animals and plants still in use. His great work, the *Systema Naturæ*, was first published in 1735, and reached the twelfth edition in 1768. Buffon was a man of more philosophical mind than Linnæus. He was also a graceful writer and created a popular interest in natural history. He must not, however, be thought of as a mere popular writer; he opened up new fields and led the way in matters of great importance. He paid much attention to the geographical distribution of animals, and treated for the first time scientifically the natural history of the various races of mankind. He reflected upon the relationships of animals, and is recognized as one of the early evolutionists. This particular line of thought was carried further by Lamarck (1744–1829), and by St. Hilaire (1772–1844), who are the most noteworthy predecessors of Darwin.

The next phase of advance is marked by devotion to the study of structure. The first step in understanding a machine is to observe its parts, to know their relation and how they act on one another. That the animal machine is very complex will be admitted by the casual observer in respect to the higher animals, but there is a complexity about the simpler ones that is not generally appreciated. As Huxley said, when an oyster is swallowed few people realize that there passes the lips an organism more complicated in construction than a watch. The study of the structure of animals was carried on extensively and made comparative by Georges Cuvier (1769–1832) and his followers. They dissected, observed, and reduced the architecture of animals to a science. Thus arose comparative Morphology which is now considered the first stage of zoological study. It will be readily seen that structure may be taken to refer only to the more obvious parts, visible to the unaided eye, or may be also extended to include the minute construction of animal tissues. Cuvier's work in anatomy was mainly on the organs, but his contemporary, Bichat (1771–1801) pushed the analysis a step further and carefully examined the tissues. His influence on the progress of zoology was much greater than is generally appreciated. For it is a fact that has been gradually forced upon naturalists that the processes of life take place deep in the finer structure of animals and plants. Bichat did not reach the units of structure in his work, and studies in microscopic structure were carried to a deeper level before they reached this goal. This work was done for animal tissues in 1840 by Schwann (1810–81), and led to the establishment of the cell theory (which see). In its original form the cell-theory was very imperfect; it was extended by the discovery that the cell is a globule of protoplasm containing a nucleus, and was moulded into the protoplasm theory mainly through the work of Max Schultze in 1860. See BIOLOGY.

There is still another aspect of structural study that was brought out by observations on the development of animals. The structure of animals is so complicated that it is difficult to comprehend. There are, especially in higher animals, many rudimentary organs and traces of structures that do not conform to the life of the animal, and to its position in the animal scale. Now, all animals begin their life in a microscopic rudiment — the egg which is, in reality, a cell set free from the body of the parent. This cell by division gives rise to new cells which remain connected, and form the many cells out of which the tissues are built. Thus, animals start in a state of simplicity and grow to complexity. By observing the various stages through which they pass we get clues to the meaning of the rudimentary organs, and to the relationships of animals, that would be completely lacking if we could not observe them in the process of becoming. Therefore, embryology or the development of life (which see) becomes the key to understanding animal structures. This important branch of zoology was started in its modern phase by Wolff, in 1759; but Von Baer (1792–1876) is designated the "Father of modern embryology" because, about 1827, he made this study a tracing of the history of the cell-layers.

The study of structure leads naturally to the question of use — What is the particular office or function of the organs, the tissues, and the cells? This line of study is called Physiology. It is to be understood that

while advances were being made in reference to the construction of animals, similar advances were in progress in reference to their physiology. William Harvey (1578–1657), Haller (1708–77), and Johannes Müller (1801–58) represent a succession of investigators in this line who pushed physiology forward. Müller, in particular by his extraordinary industry and great insight into both anatomy and physiology, had great influence on the progress of zoology.

Zoology up to the year 1860 is the product of the concurrent growth of knowledge in regard to the structure of animals (morphology), their development (embryology), and their vital activities (physiology). There was then introduced an additional element, which has illuminated the whole field. This was the doctrine of organic evolution, as set forth by Darwin in 1859. We must note in passing that this was not the beginning of the doctrine of organic evolution (see EVOLUTION); it was the particular form of Mr. Darwin's explanation that led to its taking firm hold for the first time upon the minds of naturalists. From that time to the present the study of zoology has been dominated by the idea of evolution, and animals and plants have been studied broadly, in the light of their ancestral history. Progress is still dependent upon advance in anatomy, physiology, and embryology, but the point of view from which the facts are considered has been changed.

We have now traced the rise of zoology in its principal phases down to the beginning of its especially modern aspect. The study of animal life is so great a field that naturally it has a number of divisions; it remains, therefore, to mention in a summary way its chief departments. That part of the subject which embraces the study of animal structure is *Morphology*. This word is generally used in a broad sense to mean something more than the word *Anatomy*, which is one division of Morphology. The study of microscopic anatomy is called *Histology*. It is not a different kind of study and is separated from anatomy merely as a matter of convenience. The investigation of stages in animal development is *Embryology*. These divisions make up *Structural Zoology*. The general description and classification of animals is *Systematic Zoology*. The modern name for classification is *Taxonomy*. The *Geographical Distribution* of animals has been widely studied and elevated to the rank of a special department. Another set of studies concerning the lineage of all animals (*Evolution*) has led to broad considerations of the relation of living animals to their surroundings, to the universe, and to man, and has given rise to *Philosophical Zoology*. Standing co-ordinate with the great field of morphology is *Physiology*, which, broadly speaking, concerns itself with the vital processes of all living organisms. *General Physiology* is clearly a department of zoology. Many experiments are being made to determine the responses and adaptations of animals to stimulations, and to changes in the medium in which they live. This has opened the field of *Experimental Morphology*. Studies of the mental powers and the mental phenomena in animals lead to *Animal Psychology*, which may fairly be considered a part of zoology. A division called *Ætiology* is often recognized, having as its object the investigation of the causes of zoological phenomena, but it need not be assigned an independent rank, as the study of all phenomena has as an ultimate object the discovery of their causes.

The animal world is too extensive to attempt to give an outline view of it here, and reference must be made to text-books for further consideration. Fuller accounts of some of the subjects touched upon in this article will be found under the headings, ANATOMY, DEVELOPMENT OF ANIMAL LIFE, EVOLUTION, CELL DOCTRINE, PHYSIOLOGY, PROTOPLASM, SPONTANEOUS GENERATION, etc.

Among the best books for the general reader and student of zoology are the following: Agassiz's *Methods of Study in Natural History* (17th ed. 1886); Huxley's *The Crayfish, An Introduction to the Study of Zoology* (1884); Hertwig's *General Principles of Zoology* (1896); Lankester's article *Zoology*, Encyclopædia Britannica; Sedgwick and Wilson's *General Biology* (2d ed. 1895); Parker's *Elementary Biology* (3d ed. 1897); Thompson's *The Science of Life* (1899), *The Study of Animal Life* (3d ed. 1896), *Outlines of Zoology* (3d ed. 1899); Verworn's *General Physiology* (1899); Jordan and Kellogg's *Animal Life* (1900); Bell's *Comparative Anatomy and Physiology* (1887); Parker and Haswell's *Text-Book of Zoology* (2 vols. 1898), *Manual of Zoology* (1900); Boas' *Text-Book of Zoology* (1896); Brook's *Handbook of Invertebrate Zoology* (1882); McMurrich's *Invertebrate Morphology* (1894); Shipley and McBride's *Text-Book of Zoology* (1901); Weidersheim's *Comparative Anatomy of Vertebrates* (new ed. 1898); Lang's *Comparative Anatomy* (1891–96); Romanes' *Darwin and after Darwin*, Vol. I. (1894); Osborn's *From the Greeks to Darwin* (1894); Balfour's *Comparative Embryology* (2 vols. 1880–81); Marshall's *Vertebrate Embryology* (1893); Hertwig's *Text-Book of Embryology* (1893); Korschelt and Heider's *Invertebrate Embryology* (1890–93); Wallace's *Geographical Distribution of Animals* (2 vols. 1876), *Malay Archipelago* (1869); Bates' *Naturalist on the Amazons* (new ed. 1892); Heilprin's *Geographical and Geological Distribution of Animals* (1887); *The Standard Natural History* (edited by Kingsley, 6 vols. 1888). For books on birds, butterflies, insects, etc., see under those topics. Among the best smaller zoologies adapted for use in secondary schools are those of Colton, Davenport, Kellogg, Needham, and Packard.

WILLIAM A. LOCY.

Zoophyte (*zō'o-fīt*), an old name for marine animals forming branching or tree-like colonies, and, therefore, presenting a general resemblance to plants. The sponges, hydroids, branching corals, and polyzoans were included under this very general title. The name signifies the plant animal, and is more especially applicable to hydroids and branching corals. See HYDROZOA.

Zoospore (*zō'ō-spōr*) (in plants), the swimming asexual spores of algæ, notably the green algæ. The name means "animal spores," referring to the fact that they move like aquatic animals. See SPORE.

Zoroas'ter is the name of the founder of what is known as the Parsee religion of ancient Persia. He seems to have been born in Bactria, but most of the legends concerning his history are utterly unreliable. Even the time when he lived is uncertain, but it may be safely estimated to have been as early as 1000 B. C.; probably he was a contemporary of Moses. The fundamental idea of Zoroaster's creed is its dualism. At the beginning there existed two spirits, *Ormuzd*, who represented the good, and *Ahriman*, the evil. Ormuzd is light and life, law, order, truth, and all that is pure and holy; while Ahriman is darkness, falsehood, corruption, evil, and death. These two spirits are represented as in perpetual conflict for the mastery of the world; but the final triumph of Ormuzd, the good spirit, is promised to comfort the hearts of all the faithful.

Other features of Zoroaster's system of doctrine may be briefly mentioned: (1) The principal duty of man in this life is to obey the word and commandments of God; (2) disobedience is punished with the death of the sinner; (3) those who obey the word of God will be free from all defects; (4) men should pray to God and worship, as he always hears the prayers of the good; (5) the souls of the pure and good will enjoy everlasting life, while those of the wicked will suffer everlasting punishment.

Zouaves (*zō-āvz'*), a body of troops in the French army, which derives its name from a tribe of Moors in Algiers, who were taken into the French military service after the conquest of that country in 1830. They were first united in the same battalions with Frenchmen, retaining their Moorish dress, but as it was soon found that the system of commingling the two races was not practicable, the French and Kabyles were formed into separate companies. Gradually, however, the Kabyles were eliminated, and since 1840 Zouaves have been correctly described as French troops in a Moorish dress. They are recruited from the veterans of the ordinary infantry regiments, who are distinguished for their fine "physique," tried courage, and hardihood. The uniform consists of a loose jacket and waistcoat of blue cloth ornamented with yellow braid, loose madder-colored trousers, brown cloak, madder-colored fez cap with a yellow tassel, surrounded by a green turban, a light blue sash of wool, yellow leather leggings, and white gaiters, and they are armed with a carbine and sword bayonet.

Zu'lu is the name of that portion of the Kaffir race who inhabit Natal and the region northeast of it, until they gradually merge into the mere negro of the east coast north of the Zambesi. The Zulu Kaffir is a far more amiable savage than his brother of the Cape frontier districts. He is less warlike, more industrious, and far more willing to act in the capacity of a farm laborer or domestic servant. He is by nature social, light of heart, and cheerful. His affections are steady and enduring, but his passions are strong and are called out in all their force in a state of war. Whatever better nature he may possess, when his chief commands war he is converted into a demon. That the warlike qualities of the Zulus have not decayed was seen in the war that broke out in 1879 between England and Cetewayo, the Zulu king.

Zu'luland is the country lying northeast of the colony of Natal, between its eastern boundary and Delagoa bay. Previous to the war of 1879, there was no good map of the Zulu country, and even yet we know very little of its geology or mineral productions. The principal rivers are the Umvolozi or St. Lucia river, which enters the sea about eighty miles northeast of the Natal frontier, and the Mapoota and its branches, which drain the north part of the region and fall into Delagoa bay. None of these rivers are available for inland navigation, although a large lagoon near the mouth of the St. Lucia river can be ascended for a few miles. The rivers which flow into Delagoa bay are sluggish streams, with scarcely perceptible currents and can be ascended for some distance. The principal inhabitants are of the Zulu race, but the Portuguese have a settlement on Delagoa bay where they carry on some trade with the natives and Dutch Boers. In December, 1897, Zululand was incorporated with Natal under the British crown. Its area is about 12,500 square miles, with an estimated population of 181,000, including 1,100 whites.

Zurich (*zū'rik*), a city of Switzerland, capital of the canton of the same name, is situated at the point where the Limmat issues from the lake of Zürich and unites with its tributary, the Sihl. It is one of the most prosperous manufacturing and commercial towns of Switzerland, yet the narrow streets and lofty houses of its older quarters give it the appearance of a mediæval city. There are many interesting old buildings, the most remarkable being the cathedral erected in the 11th century. The town library is an extensive one, and numerous museums of natural history and other similar institutions indicate the intelligence and cultivated tastes of the inhabitants. There is a Polytechnic school with 935 students and 455 listeners, and the

University of Zürich with 121 instructors and 731 students. Population 150,239.

Zu'rich, a lake of Switzerland, surrounded by the three cantons of Zürich, St. Gall, and Schwyz. It is between 20 and 25 miles in length, about two miles in breadth, and about 500 feet deep. It is noted for the beautiful scenery along its banks, the hills around it being covered with numerous gardens, vineyards, and orchards.

Zuyder Zee (*zoi'der zē'*), a bay on the coast of Holland, separated from the North sea or German ocean by the four islands, Texel, Vlieland, Terschelling, and Ameland. It is from 75 to 80 miles in length, its greatest breadth being 35 or 40 miles. In the time of the Romans, the Zuyder Zee was a marshy lake communicating with the North sea by a small river, but in the latter part of the 13th century two heavy inundations took place which broke down the dikes and submerged the whole territory, except the four islands above named, making it an arm of the North sea.

Zwingli (*tsving'le*), **Ulrich,** Swiss reformer, was born at Wildhaus, in the canton of St. Gall, Jan. 1, 1484, and after being educated at Bern and at Basel, became pastor in Glarus in 1506. Having begun to study Greek in 1513 he devoted himself from that time forward to the study of the New Testament, even going so far as to learn by heart the Epistles of Paul in the original language. In the year 1518, he was called to Zürich, and in 1522 the Reformation was formally established in that city. In 1524, Zwingli married and soon after published his work, *Of the True and False Religion*. Luther and Zwingli agreed on most points, but there was a serious breach between them in regard to the real presence of Christ in the Lord's supper, Luther adhering to this dogma and Zwingli denying it. A conference, arranged by Philip, landgrave of Hesse, was held between them at Marburg in 1529, but after spending three days in earnest discussion they separated without coming to any agreement on the point at issue. In 1531, open war broke out between Zurich and the Catholic cantons of Lucerne, Schwyz, Uri, Unterwalden, and Zug; and Zwingli, by command of the council of Zürich, had to take the field with the banner of a canton, which had always been borne by a priest. The Zürichers met their foes at Kappel, but were outnumbered and defeated, Zwingli being among the slain. A great bowlder, roughly squared, marks the place where he fell Oct. 11, 1531.

Zygomorphous (*zīg'o-môr'fŭs*) **Flowers,** those in which the parts of a single set are not all alike. The term is chiefly applied to irregularity of petals. For example, in the sweet pea the petals are very much unlike. In most of the mints the five petals are so modified that two form an upper lip and three a lower lip, making the so-called "bilabiate flower." The contrasting term is "actinomorphous flowers" (which see). See FLOWER.

Zygospore (*zīg'o-spôr*) (in plants), a spore formed by the union of two similar gametes, as in some of the lower Thallophytes (Spirogyra, for example). It is simply a sexual spore or "oospore," but the name is convenient in indicating the nature of the gametes. The word "zygote" is sometimes used instead of zygospore.

Zyg'ote. See ZYGOSPORE.

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